SCIENTIFIC AMERICAN

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. XXXIX.—No. 5. [NEW SERIES.] NEW YORK, AUGUST 3, 1878. [$3.20 per Annum. [POSTAGE PREPAID.]

"SNYDER'S LITTLE GIANT" ENGINE.

We illustrate on this page a complete and compact small power steam engine and boiler, familiarly known as "Snyder's Little Giant."

The great variety of small industries to which motive power can be advantageously applied has produced a demand for small, convenient, and safe motors. To meet this demand with a reliable steam engine which would be complete in every detail and yet simple and safe in the hands of the inexperienced, Mr. Snyder has brought out the "Little Giant." It is a generally acknowledged fact that it is impossible to construct boilers with shells of large diameter which will be equally as safe as those of smaller diameter. For example, by doubling the diameter of a boiler, other things remaining the same, the area of its shell is doubled, and its power of resisting pressure is diminished one half. The shells used in the "Snyder" boiler are not only of small diameter, but they are made of the finest quality of wrought iron and lap welded. The almost universal practice of joining plates of boiler iron with rivets reduces the strength of the shell, so that in boilers whose sheets are joined by a single row of rivets only 56 per cent of the strength of the iron is realized, and where the sheets are double riveted only 70 per cent of the strength of the iron is realized.

In the "Little Giant" boiler, the full strength of the iron is utilized, as no rivets are required, all of the joints being screwed together, and the joint in the shell being lap welded. The boiler is suspended over the fire, and the heat freely and uniformly circulates on all sides of it. There being no water legs or water spaces below the bottom head or cap, if through carelessness the water should be allowed to get entirely out of the boiler, the only result would be a possible damage to the lower head or cap. We are informed by Mr. Snyder that all the materials used in the construction of these boilers are tested by hydraulic pressure before it is put together, thus insuring its fitness for use before labor is expended on it.

These boilers are provided with fusible or safety plugs, which are arranged so that no sediment or scale can form on the alloy to prevent the fusion of the plug when the water becomes low.

The alloy or soft metal is contained in the pipe about half way up from the bottom of the boiler, and above it a continuation of the same pipe extends upward beyond the water level with a siphon shaped top, so that the water never comes in contact with the metal and there is no chance of scale forming over it. This boiler has a double or air jacketed casing, through which the air passes to the ash pit. This arrangement supplies the fire with hot air and adds greatly to the economy of fuel, while the loss of heat by radiation is prevented. The air supply is controlled by a damper band, shown in the engraving at top of boiler. The boiler has a novel sectional grate, safety valve, blow-off cock, and check valve. The steam gauge, and glass water gauge, and three brass gauge cocks are secured to a water column which is attached to boiler with two unions and may be easily removed for shipping.

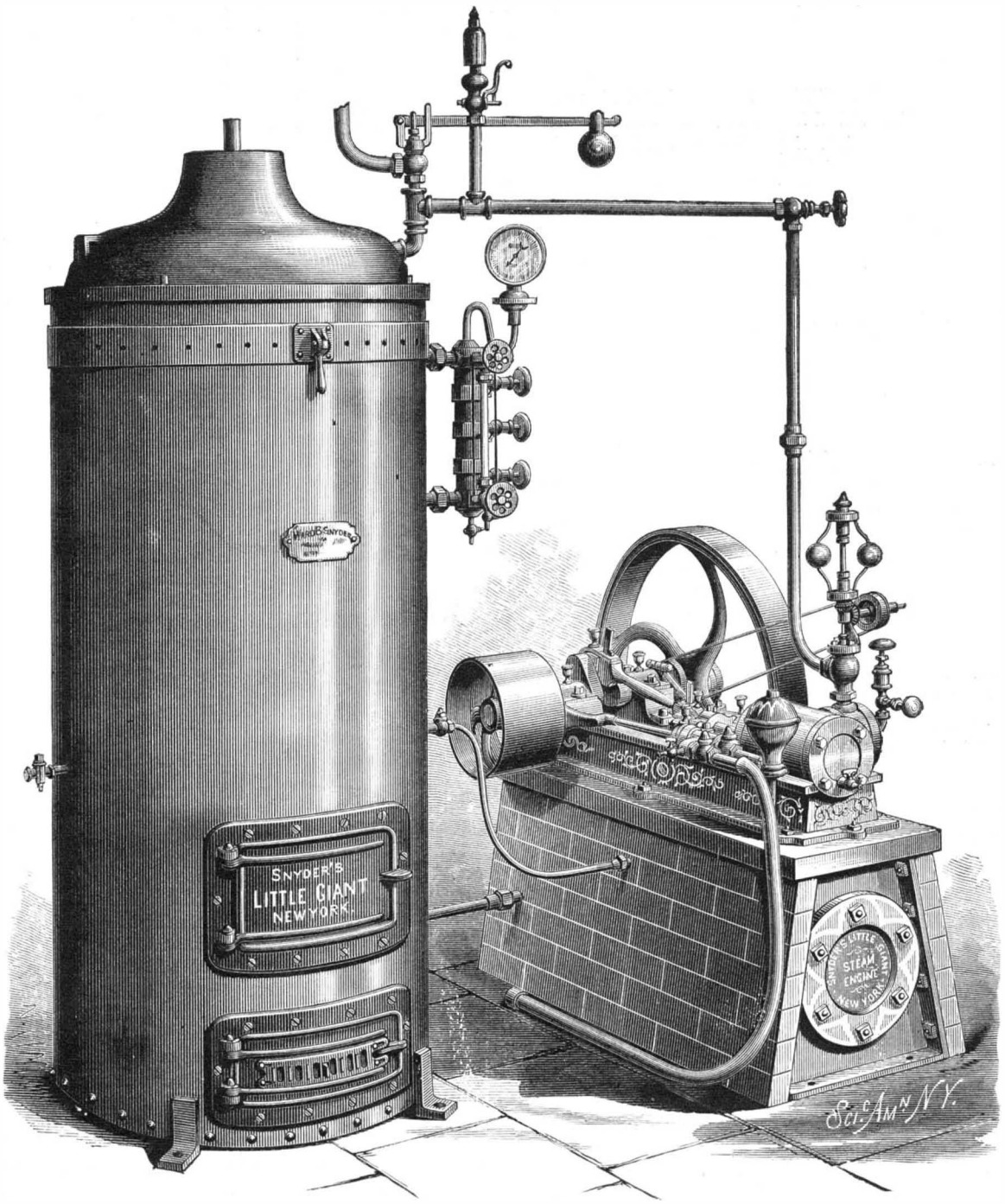
The engine is of the horizontal type. As a large majority of those who purchase small engines are not experienced or professional engineers, and the extent of their business is not sufficient to warrant the employment of one who is, it has been the aim of the builder of the "Little Giant" to avoid all superfluous parts and fittings to adapt it to the use of those not especially skilled in machinery. These engines have an improved circular flat slide valve which is held in a ring or buckle in which it is perfectly free to revolve during its travel, thus guaranteeing uniform lubrication and wearing a perfect mat.

The pistons have double metallic packing rings and are self adjusting. The pump is of the locomotive pattern and is driven by an eccentric direct from the main shaft; the plunger is made of brass and works in a brass gland, thus preventing corrosion. The slides are V-shaped and fit into correspondingly shaped recesses in the cross head, which admits of taking up all wear. Both the cross head and crank ends of the connecting rod are provided with gibs and keys for taking up wear. An oil well is cast in the crank strap, which carries a full half day's supply of oil and only feeds it to the crank pin when the engine is in motion. Brass oil cups are furnished on all other bearings, and a nicely designed lubricating cup is placed on the steam chest.

The pillow blocks are lined with anti-friction metal. Steel is used in all parts where it will increase the durability and efficiency of the engine. All working parts and the cylinder heads are polished. The cylinder is incased in black walnut and ash. The bolts and screw heads are highly polished and are of a standard size, so that should one be lost or broken it can be easily replaced.

The sides and top of base to which the engine is secured are made of plank which are bolted to flanged iron ends. This foundation is painted to closely resemble brickwork. The feed water heater passes through and is supported by the foundation, and the exhaust steam from the cylinder is conveyed through the heater. The feed water before entering the boiler is forced by the engine pump through from 30 to 40 feet (according to size of engine) of steam pipe, which is contained in the heater chamber and is surrounded by the hot steam, thereby heating it to nearly the boiling point before it enters the boilers. It is stated that from 10 to 15 per cent of fuel is saved by the use of this heater.

The celebrated "Pickering Governors" are exclusively used on these engines, and are run by a ¾" flat belt. Mr. Snyder, we are informed, has invariably made it a rule to put every engine up at his works and test them under steam with a friction brake and indicator. All parts of the engine are made interchangeable, so that they may at any time be replaced. These engines and boilers are now made from one to six horse power, at very reasonable prices. For further particulars address Mr. Ward B. Snyder, the patentee of this boiler and the proprietor of the "Little Giant" engine works, at 94 Fulton street, New York city.



SNYDER'S LITTLE GIANT ENGINE.

New Mechanical Inventions.

An improved Actuating Mechanism for Calendar Clocks has been patented by William S. Shirk, of Anderson, Indiana, which consists in a novel arrangement, in the time movement of a calendar clock, of a system of levers, springs, pawls, and ratchets, whereby the accurate movements of the indicating hands are effectually secured; and in certain details of construction which render the calendar more reliable in its operation.

Homer C. Emery, of Union, Oregon, has patented an improved Turning Chisel, which has an arm extending from the front point of turning chisel over the timber being turned. It forms a rest for the chisel while being used, and, being bluntly rounded at the point, forms a guard against the chisel entering or gouging in the timber being turned.

Ephraim M. Kimball, of Toledo, Ohio, has patented an Appliance for Flat Filing, by which plain surfaces on small work may be quickly and economically produced. It consists in a plain flat plate, which is secured to the stationary jaw of a vise, and in an adjustable head or guide, which is secured to the end of the file.

James Brett and Bethune Perry, of Albion, Cal., have patented an improved Saw Mill Head Block, which consists in a combination of set wheels, provided with notches for receiving a detent, and with ratchet wheels and levers for disengaging the detents and moving the set wheels. It also consists in an arrangement of gearing by means of which the screw of the head block may be moved independently of the set wheels.

John W. Cleland, of Nevada, Missouri, is the inventor of an improved Wind Engine, which consists in a vertical wheel having curved vanes or blades that are connected with a governor carried by the wheel shaft. The supply of wind to the wheel is controlled by hinged deflectors, and the wind on entering the wheel acts on the outer surface of the vanes on one side of the wheel and upon the inner surface of the vanes on the other side of the wheel. The force of the wind is thus twice utilized.

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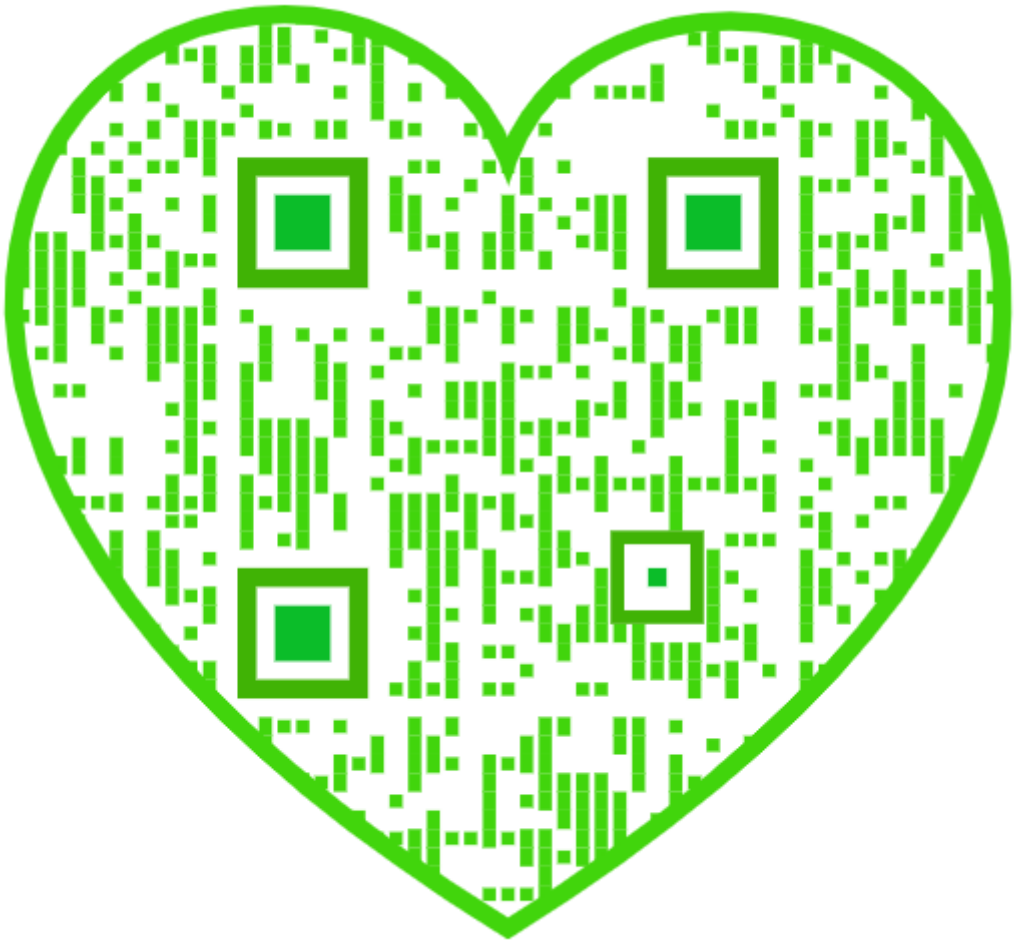

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NEW YORK, SATURDAY, AUGUST 3, 1878.

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IX.—CHESS RECORD.—Biographical Sketch of E. S. BREWSTER, of Springfield, Mass.; with Portrait and one of his Problems.—Lebanon *Herald* Tournament, No. 2.—Association Letter Tournament of 1878.—A Work on Problem Composing.—Solutions to Problems.—Valedictory.

Price 10 cents. To be had at this office and of all newsdealers.

SMOKE AND SPARKS.

The recently published advertisement of the Metropolitan elevated railroad of New York city, for some device for preventing the escape of sparks from their locomotives, touches a matter interesting as well to all railroads, and one whose successful solution would be of more value than any other improvement now sought by them. It is well known that the "spark tax" in the shape of damages for destroying fences, crops, buildings, bridges, snow sheds, etc., is no light burden to many of our roads, though it may not be as well understood that these sparks are the product of such imperfect combustion that thereby a large percentage of the calorific value of the coal is lost.

It is surprising when one considers the importance of a remedy that its discovery has been so long delayed, and that it was left for a small city road to be the first to publicly advertise its necessity, notwithstanding the fact that there is scarcely a railroad in the country, or indeed anywhere, to which the remedy would not be of greater money value.

It can hardly be fear of direct pecuniary damage which may arise from escaping sparks that moves the Metropolitan Company to an attempt to subdue them, for loss in this way would never be excessive in a city with such a competent fire department as ours; it must be the force of concentrated public opinion alone—possible and efficient only in large communities—which, though it quietly endures time-honored nuisances (a cause of congratulation to the Boards of Health and Police), is now aroused and excited by the development of a new one.

Deflecting arches in the fire boxes, spark arresters in and on the smoke stacks, designs for wetting down, and designs for returning the sparks to the fire box, and grates of various kinds have all fallen short of the purpose in a greater or lesser degree, and still the search for something suitable goes on.

In his treatise on the steam engine Mr. Bourne, who has almost exhaustively studied, investigated, and experimented in the matter, says: "Nearly all the expedients hitherto introduced for burning smoke (this includes the fine cinders) in locomotives are adaptations of the devices heretofore in use for burning smoke in land engine furnaces. But the rapid combustion which a locomotive boiler requires renders the burning of smoke by any of these ancient devices a matter of very difficult achievement, and it seems to be indispensable that a method founded on a totally new principle should be introduced. It appears to us that the fuel and air must be fed in simultaneously, and the most feasible way of accomplishing this object seems to be in reducing the coal to dust and blowing it into a chamber lined with fire brick, so that the coal dust may be ignited by coming in contact with red hot surfaces after having been mingled with the quantity of air necessary for combustion. This, however, in common with other improvements upon the locomotive, requires to be worked out."

There is no question but the majority of the mechanical designs we have above enumerated are ingenious and useful, but they have not been evolved in recognition of the undoubtedly correct principle laid down by Bourne, and hence have failed to satisfy the conditions.

Doubtless the policy which many of the railroad corporations have of late years pursued toward inventors has had much to do with the continuance of this costly nuisance, for it is notorious that inventors, who are rarely shrewd men of business, fare worse in the hands of these companies than they do with any others with whom they have dealings. The acknowledged necessity of the Metropolitan road will naturally bring many devices before the public, as well as to the notice of the company, with more or less well founded claims to investigation; and it is to be hoped that our national ingenuity will not be taxed in vain; that to our inventors will belong the credit of a final settlement of the question.

Another objectionable feature, and the cause of well grounded complaint in addition to the smoke and flying cinders, is the offensive sulphurous odor from the burning coal. Suggestive, at least, of the solutions of these difficulties, if not fully satisfying all the required conditions, are two articles which we have given in recent numbers of this journal, the one entitled "Our Iron Industry," and the other "Preparation of Iron Fuels;" in these we called attention, among other matters, to some of the advantages arising from the use of pulverized fuel, and to the economical preparation of coal in a manner that would prevent smoke and sulphur fumes, and it seems highly probable that a combination of these devices, or some modification of them perhaps, may meet the present exigencies, and that their economies would more than compensate for the expense of application.

COSTS OF SILVER AMALGAMATION.

From several of the prominent Nevada silver mines we learn that the cost of the wear per ton of ordinary silver ore upon the amalgamating pans in general use varies from 60 to 65 cents, and that from 1 to 1¼ pound of quicksilver per ton is lost in slimes and flouring, each pound carrying off with it about $1 worth of silver. In some instances the pans are supplemented by inclined tables, covered with quicksilver-coated copper, which arrest a portion of the slimes.

It seems to us that something better than even this combination could be devised, which should cost less and be more effective and economical in its working—something partaking of the nature of each. Let us imagine, for instance, two or more copper lined troughs, set side by side and connecting near the ends, each furnished with a copper bladed screw made to revolve therein close to the bottom; and that both the lining and blades be coated with mercury, a quantity of which shall also be placed in the bottom of the troughs. If the ore were reduced to a sufficient fineness and run into this amalgamator it would be pushed to and fro, throughout its length, again and again, until every particle had been repeatedly brought in contact with the revolving blades, the lining and the quicksilver lying in the bottom. No accumulation of slimes, no flouring could occur under these conditions, we think; nor would the wear on the machine or the power required to run it approach that of the present amalgamator.

Perhaps for this the ore should be more finely powdered than for the pans, which of themselves do a great deal of grinding; but as finer pulverization is coming more in vogue, and in most instances much to the advantage of the innovators, other styles of amalgamators to suit the new conditions must naturally make their appearance.

ADVERTISING FOR FOREIGN TRADE.

The course of trade of late years has pretty thoroughly established two things, namely, that American manufactures are well fitted to compete with those of other nations in the markets of the world, and that our future home prosperity must hinge very largely on our ability to extend our foreign trade. If we had to-day an assured foreign market for a large part of the products which our factories are capable of turning out, the home demand for the same goods would be straightway increased enormously. Many of our mills are idle not because they represent so much productive power beyond the national capacity to consume, but because a large proportion of our consumers are on short allowances, for lack of employment, or other reasons. The moment they are set to work their expenditures will increase; and many useful industries, now languishing for lack of a market, would revive and flourish on the increased home trade. It would appear, however, that the initiative must come from foreign orders. Accordingly it is at once a sound financial policy and a patriotic duty on the part of our great manufacturers to make their wares known in the widest manner possible. That many of them appreciate the policy is evident from the advertising pages of the numerous export trade journals that come to our table. That the same line of evidence is not overlooked abroad is plainly shown in the comments of the British *Ironmonger* on the vigor and determination with which our export trade journals have entered the fields of trade so long all but monopolized by the British. The *Ironmonger* notes also the well displayed and handsome advertisements by which our manufacturers make known their products. In the matter of engraved illustrations the American advertisements are immensely more attractive than those of the British, and already British agents abroad are sending home the complaint that better cuts and better printing must be employed by their superiors, or else it is useless to expect success in competition with American artisans and artists.

The American papers specially devoted to the advancement of foreign trade are the New York *Times*, Spanish edition; *Journal of Commerce*, Spanish and Portuguese edition; Frank Leslie's Spanish and Portuguese edition; Philadelphia *North American*, Spanish edition; Boston *Journal of Commerce*, export edition; *Iron Age*, monthly; *El Espejo*, Spanish; the *American Mail*, the *American Exporter*, and, we may add, the SCIENTIFIC AMERICAN export edition.

To some this list may seem out of proportion to the amount of our foreign trade. We do not think so; it is certainly not out of proportion to the trade they will help to build up. The world is wide, and, as yet, comparatively few of its inhabitants have learned how many things America can supply to meet their various needs. As fast as the information is conveyed to them the demand for American products will increase, and trade will follow. That wide awake merchants and manufacturers appreciate these facts is clear from the promptness with which they avail themselves of the new opportunity to reach the outside world afforded in the SCIENTIFIC AMERICAN export edition. The second issue, published this week, carries out the advertisements of over one hundred of our leading houses. We may say also, without boasting, that no paper ever set out on a like errand so generously freighted with fresh, timely, and useful information.

Labor in France.

The Consul at Nice reports that the common labor of his district on roads, buildings, etc., is monopolized by the industrious and frugal Piedmontese, who earn from 30 to 38 cents a day. Agricultural laborers are few in number, and earn from 47 to 57 cents a day. The small farms are mostly tilled by the peasants, who own them or work them on shares. Mechanical labor is comparatively high. Plumbers, coopers, and upholsterers get from $1.20 to $1.56 a day; carpenters and smiths from 88 to 98 cents; journeyman tailors as high as $1.56; compositors, shoemakers, and masons from 80 cents to $1 per day. The cost of living to the ordinary laborer is from 30 to 38 cents daily. His food is Indian meal, bread, vegetables, and wine. Meat is seldom eaten. Meal costs 3 cents a pound, and wine 6 cents a bottle. Wages have not materially varied for skilled artisans in the last five years. The export trade of Nice is exclusively confined to oils, perfumery, fruit, and flowers, and is in a prosperous state, increasing rather than diminishing.

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FRENCH PAVEMENTS.

There are few things that more forcibly strike a stranger in Paris than the general excellence of the paving of the roadways. It is a matter of notoriety, and perhaps it is true, that the granite block paving, often called the "Belgian system," was abandoned to a large extent in Paris because the blocks furnished a convenient material for the barricades with which the insurgent population of the city occasionally amuse themselves and bother their rulers. There yet remains a large amount of block pavement, and the macadamized road is still common. So far as these are concerned there is nothing particular to say except that they are kept in excellent condition by repairing whenever a portion begins to grow faulty, and by sweeping regularly every night and watering every day when required, and very often when there seems to be no necessity. The sidewalks are swept very early, and the gutters are all thoroughly washed out and swept clean with brooms every morning.

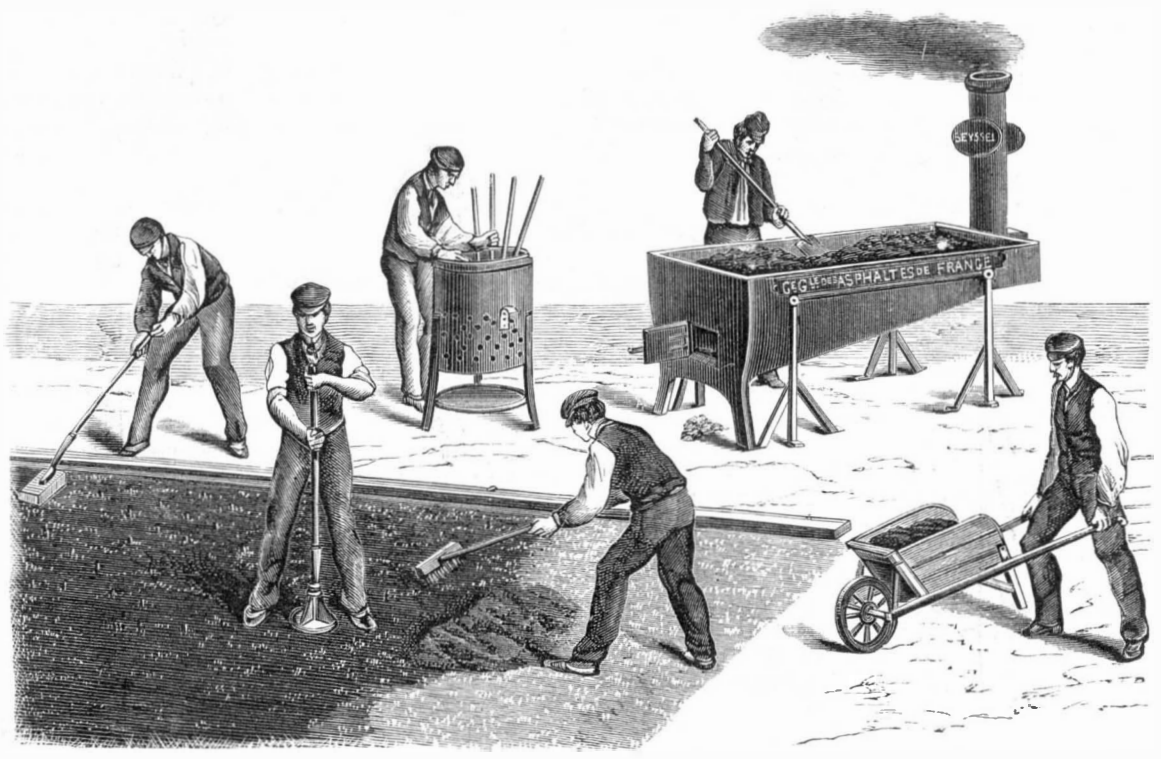

Fig. 1.—SYSTEM OF LAYING DOWN THE ASPHALTE COMPRIMÉ.

These matters cannot be overlooked, but they involve questions of taste, care, and the economic administration of public funds, perhaps a more important question to us than most of the matters which occupy the time of Congress. It is not of them that I propose to write, but of the asphalt pavements which are fast becoming the principal mode of paving in the city. The substitution of asphalt for blocks is going on all the time.

There are several companies of Paris which execute this work by contract, perhaps the largest being the "Compagnie Générale des Asphaltes de France," which claims to have the sole concession for this country of the products of the mines of Seyssel, and of the Val de Travers in Switzerland.

The asphalt paving is of two kinds: the *asphalte comprimé*, that is, beaten and compacted with hot rammers; and the *asphalte coulé*, in which the material is spread with trowels.

We may consider them in this order. This company has laid their *asphalte comprimé* in 158 of the streets and places of Paris, between 1855 and 1877. This shows the period within which the great change in the system of paving has been effected. Beginning under the Second Empire, it is still in progress.

The *asphalte comprimé* is especially employed around the churches, schools, theaters, concert halls, banks, and public buildings, on account of its freedom from noise; and generally for the additional reasons of cleanliness and salubrity in the places mentioned and also in the main streets of the city. In the fashionable drives macadam is preferred on account of its freedom from slipperiness, and on the quays and warehousing quarters of the city the block system yet remains a favorite.

In the preparation of a good concrete foundation for asphalt pavement, as practiced in Paris—and the lesson cannot be as well learned elsewhere—four things are necessary:

1. Materials of good quality. 2. Used in proper quantity. 3. Mixed energetically; and 4. Allowed proper time to consolidate.

Not one of these is to be dispensed with; the second and fourth may not be inflexible, as a difference in the quality of articles procurable in different countries or cities may require special treatment in the working of it.

A general idea of the method adopted in Paris may be gained from an observation of the process as pursued in the Rue Scribe, where I observed them to be taking up one half of the granite block pavement, from the middle of the street to the gutter stones, preparatory to laying down asphalt. The reason for taking up half at a time is manifest, as the street is a busy one and could not be entirely spared even for a while.

The bed of gravel found beneath the stone paving was considered sufficient and was not disturbed, the first operation to be described consisting merely of placing a layer of concrete upon it to form a bed for the asphalt. There are but three materials used and but three tools. The materials are: Gravel screenings or sand; a silicious gravel in pieces, say, from ½ inch to 3 inches in diameter; a gray hydraulic lime, usually Portland cement. The tools are: Pointed shovels; two rakes with long bent prongs; two flat beaters, about 18 inches square and with handles set in obliquely. To this may be added six wheelbarrows, holding about a bushel each, and 18 water buckets, of 2½ gallons each.

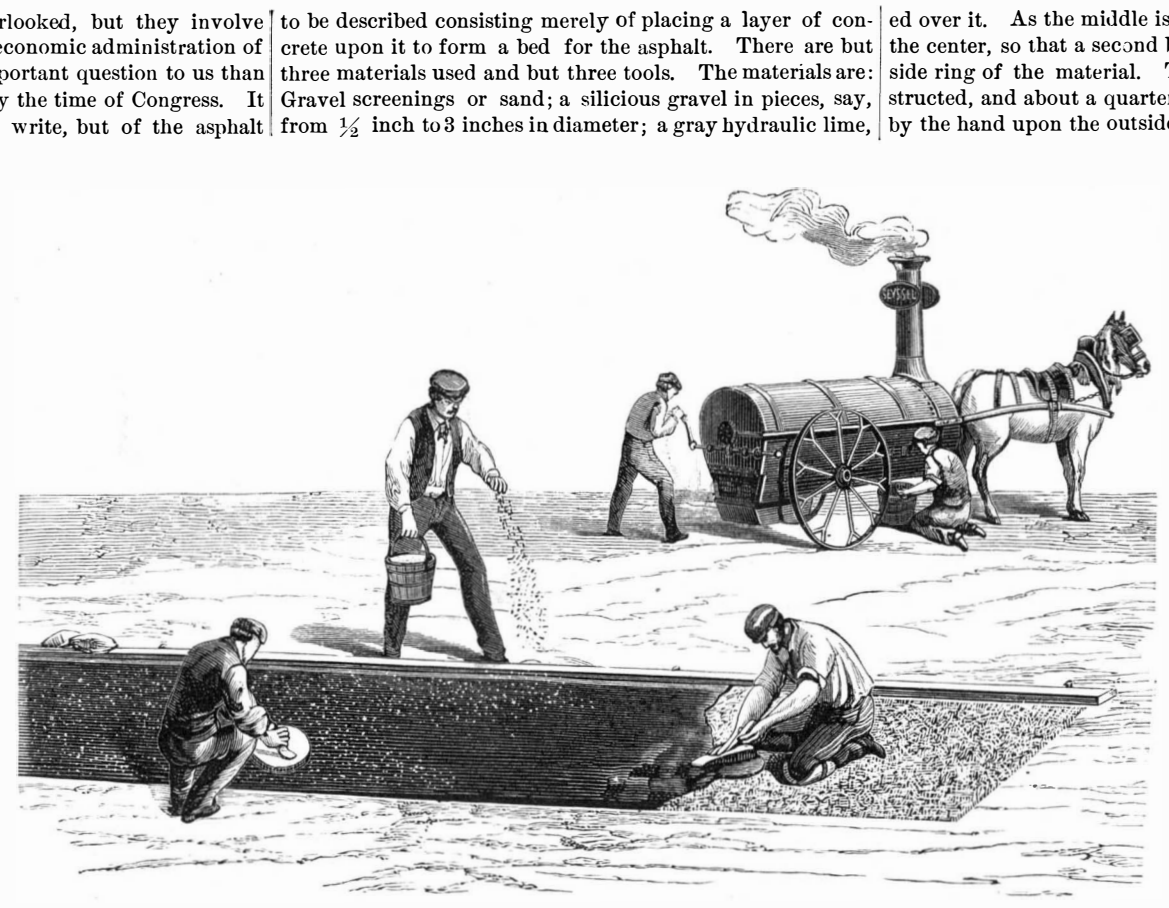

Fig. 3.—LAYING DOWN THE ASPHALTE COULÉ.

Twenty men formed the gang under a foreman, who worked diligently in giving the final shape to the surface of the concrete, preserving the proper camber of the street, gauge pegs being driven into the gravel foundation to work by, their tops representing the future surface of the asphalt. The illustration shows a smaller gang of men, but I give the actual number observed, as the proportion is a part of the accuracy of description.

Carts brought the various materials from the river and dumped them alongside where they were needed, on the pavement of the undisturbed half of the street. The water was obtained by turning on a hydrant and damming, flooding the gutter on the side of the street just mentioned.

The work now proceeds as follows: A man dumps a wheelbarrow load of sand and another spreads it out to 4 feet diameter. A bag of 3 pecks of lime is emptied on to it and spread evenly. On this 3 barrow loads of silicious gravel are emptied, and the heap is trued up into conical form by shoveling from the foot of the heap and throwing it on to the apex. The materials (in the case observed) are damp, and the lime clings to the gravel where it touches. The heap is torn down and built up in a spot alongside, the effect being to mix the materials of three different finenesses. The heap is presently flattened out to 6 feet diameter and a bucket of water distributed over it. As the middle is the wettest a cone is made at the center, so that a second bucket of water reaches the outside ring of the material. The conical heap is again constructed, and about a quarter of a bucket of water splashed by the hand upon the outside—the outlying portions of the spread mass as it lay previously upon the ground.

It rests thus a certain time, but a few minutes, and then is torn down, beginning at one side and throwing it, shovelful by shovelful, into a new location, a man with the three pronged rake, like a manure hook, working it energetically and unceasingly as each new shovelful arrives at the heap. This mixing is a very important matter, as it insures that every particle of silicious rock shall be covered with the lime, and the heap now is, instead of the yellow of the flint gravel, a uniform gray. The water is only sufficient to cause the parts to adhere, and some little (without attempting to trace the chemical reactions) lost as such in the attack of the lime on the silex and in slaking.

The heap is ready in a few minutes to be removed in barrows and dumped on the line of working, where it is spread with shovels and with a second one of the three tined rakes. Here the eye of the master is called for, and he gives it the final shape, so far as the shovels are concerned, due regard being paid to the gauge pegs.

A man with the flat beater compacts and levels the surface by his blows, and the concrete is then surfaced with an inch thick coat of hydraulic lime mortar laid on with a trowel, and on this a coat of loose sand, which roughens it and forms a bond for the asphalt, which is afterward laid hot upon it, rolled and beaten. Of this presently. The sand appears to become partially imbedded in the yet soft mortar, and is in turn grasped by the asphalt. If the final asphalt were laid upon too smooth

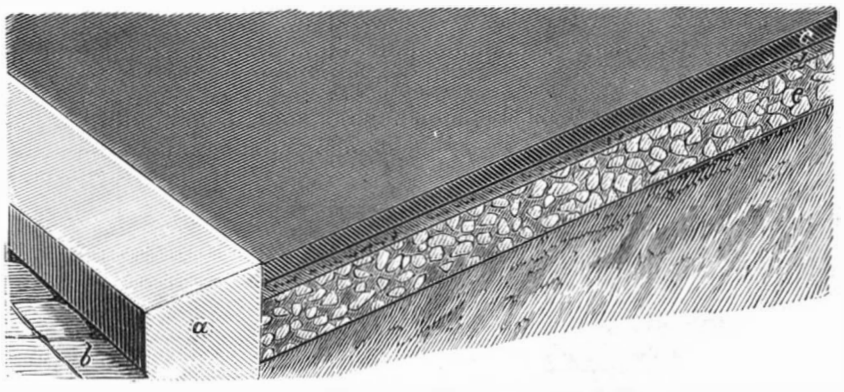

Fig. 4.—SECTION OF SIDE WORK.—TROTTOIR

a, curb; *b*, street; *c*, asphalt; *d*, mortar; *e*, béton.

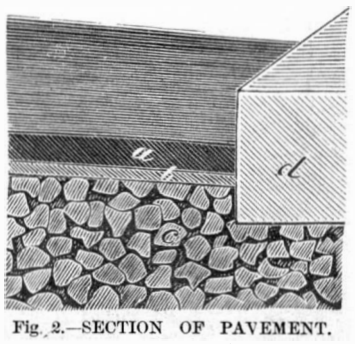

Fig. 2.—SECTION OF PAVEMENT.

a, asphalt; *b*, mortar; *c*, béton of Portland cement and gravel; *d*, curbstone.

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a surface it would be apt to fail in adherence and to flake off. Its mere adhesive quality is aided by a mechanical bind to the particles of sand which are, so to speak, riveted in the mortar, and it in the concrete.

I have been thus particular in stating the matter in order that persons disposed to try the experiment may have some to data save them time in experimenting.

The result of the carefully executed work would repay any city or corporation which should be in need of smooth, clean, and easily repaired ways.

After a few days, the foundation, having been carefully guarded from disturbance by travel, having become fully set, the asphalt compound is brought hot in carts, and being transferred to wheelbarrows, dumped upon the surface of the foundation concrete and spread by rakes to a thickness of about 4 inches. It is then lightly pounded by a very hot iron rammer with a circular face 10 inches broad. A furnace is kept on the sidewalk for heating the rammer. A second ramming with hard blows of the same rammer then takes place, condensing the asphalt to but little more than one half its thickness apparently, and causing its intricate union with the rough surface of the layer beneath.

The final smoothing is given by a hot iron block, which is pushed and pulled over the surface and burnishes down the elevations and rough marks of the pounders.

The *asphalte coulé* is laid with a trowel upon the concrete basis and is not pounded, as in the case of the *asphalte comprimé*. It is used for sidewalks, platforms, and waiting saloons of railways, prisons, skating rinks, baths, warehouses, breweries, and manufactories of all kinds.

To make a square meter of surface, 15 millimeters thick, it is necessary to use 1½ kilo. of bituminous minerals, 23 to 24 kilos. of Seyssel mastic, and 13 to 15 kilos. of washed, dried, and sifted gravel. 1,200,000 square meters of *asphalte coulé* have been laid down in Paris by this firm.

A large portion of the floor area in the Exhibition building, Champ de Mars, is covered with this material. Many of the covered ways in the buildings, the transverse passages, and the walks under the verandas are floored with this material marked off into squares so as to resemble tiles or marble slabs.

The material is also wrought up into the form of tiles and laid upon a soft and level bed of concrete, melted mastic being poured into the joints and fashioned by the rule and jointing iron. The prices of these tiles are as follows:

Thickness, metric.	Weight per square meter, kilos.	Price per square meter, francs.
0·015	36	2·50
0·020	48	3·35
0·030	72	5·00
0·040	96	6·70
0·045	108	7·50
0·050	120	8·35

The two lighter descriptions are used for walks, stables of the smaller animals, thrashing floors, coach houses. The medium thicknesses for stables and cow houses. The thickest for the driveways of hotels and paving of courts serving for the passage of loaded vehicles.

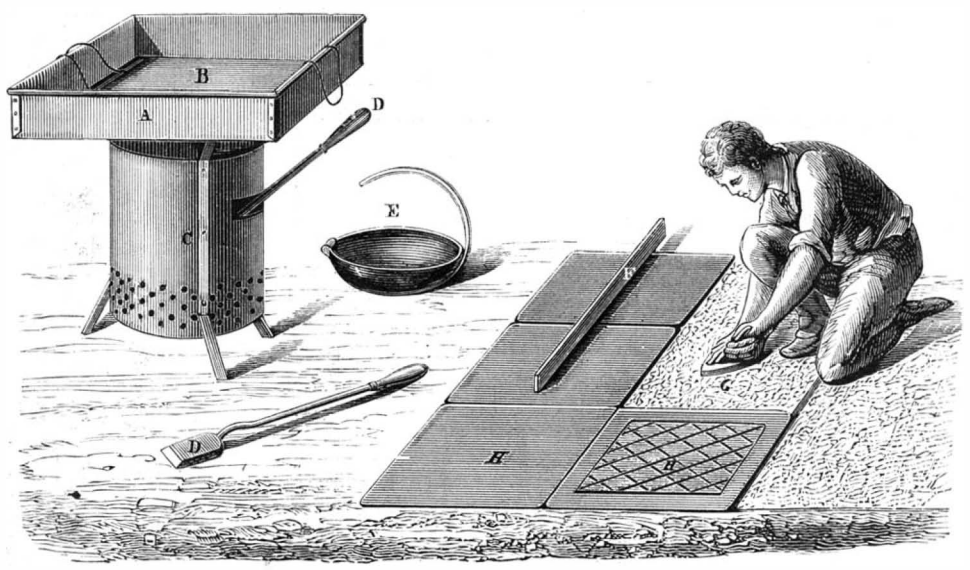

Fig. 5.—IMITATION OF TILE PAVEMENT (*carrelages*) IN ASPHALT.

A is the pan, B is the woode plate in the hot water pan where the tiles are heated; C is the furnace; D is the jointing iron; E is the pan for melting and pouring the mastic for the joints; F is the wooden rule; G, preparing the foundation of beton; H, the tiles, smooth or channeled.

The bridge over the Seine at Elbeuf has 1,200 square meters of *asphalte comprime* surface laid upon concrete above the joists and iron arches. It affords another instance of the mode of application, the joists being supported upon the iron trusses.

The foundation of bitumen or asphalt when properly laid is proof against permeation by water or vermin, and is much used in the manner indicated.

The coating is of mastic mixed with sand and applied hot over a surface of mortar of silicious sand and hydraulic lime.

Cellars and caves (silos are much used in France for storing roots and grain. It is the old Eastern and Southern practice, and seems to have been adopted from abroad. At St. Ouen, near Paris, are immense subterranean storehouses for grain, where it may be kept undamaged for years.

Corn fodder (maize) is put away in large quantities, in silos as much as 60 feet long, being packed in tightly and slightly salted. The circulation of air is prevented, and it affords green forage all winter and early spring.

Roots are kept with less difficulty for animals, and the beet root, which is the principal source of sugar in France, is stored in enormous quantities, so as to spread the process of extraction over a larger period of the year.

The silo shown is especially constructed for the conservation of the pulp of beets.

A layer of asphalt affords a means of excluding the water in wet or damp foundations from the upper part of the structure, as in the case of the stratum, *a*, interposed between two courses of bricks or masonry.

The above will give some idea of the variety and extent of the uses to which asphalt is applied in France, and especially in Paris, and may be useful to some who read your valuable paper.

EDWARD H. KNIGHT.

Paris, June 28, 1878.

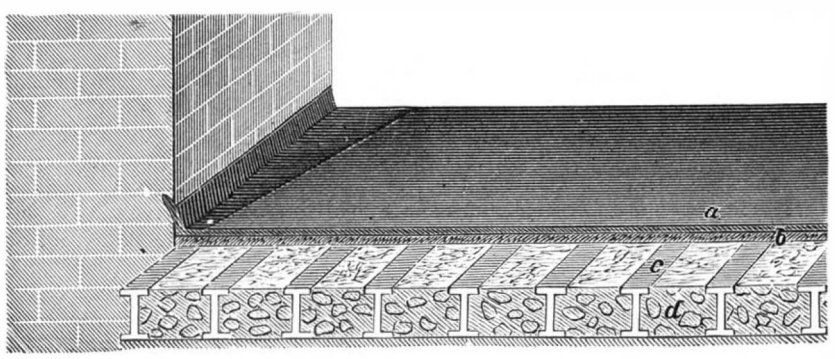

Fig. 6.—TERRACE OF CHATEAU DE CHAMBORD,
a, asphalt; *b*, mortar; *c*, joists; *d*, masonry filling.

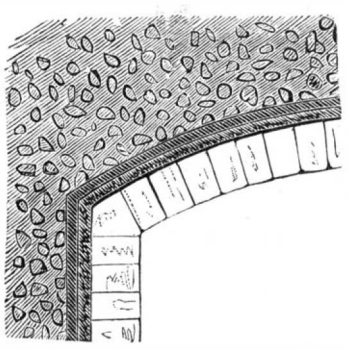

Fig. 10.—COVERING FOR CASEMATES.
(Port de Tourneville, Havre.)

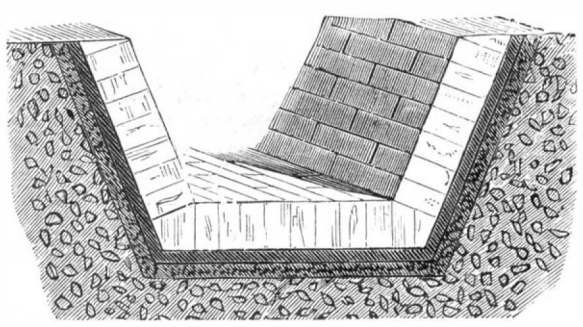

Fig. 11.—SILO FOR BEETS, PULP, OR GRAIN.

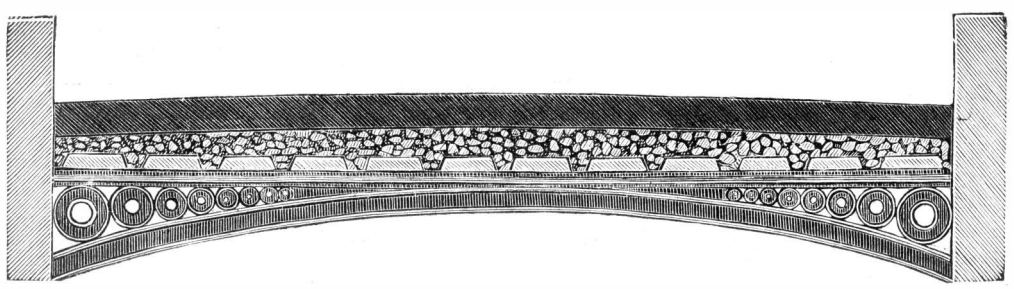

Fig. 7.—BRIDGE OVER THE SEINE AT ELBEUF.

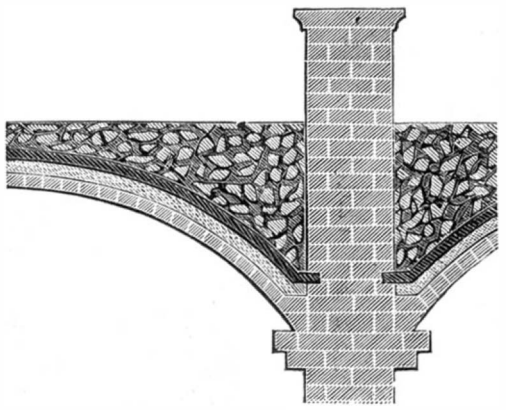

Fig. 9.—WATERPROOF COVERING FOR ARCHES.
(Bridge over the Loire near Tours.)

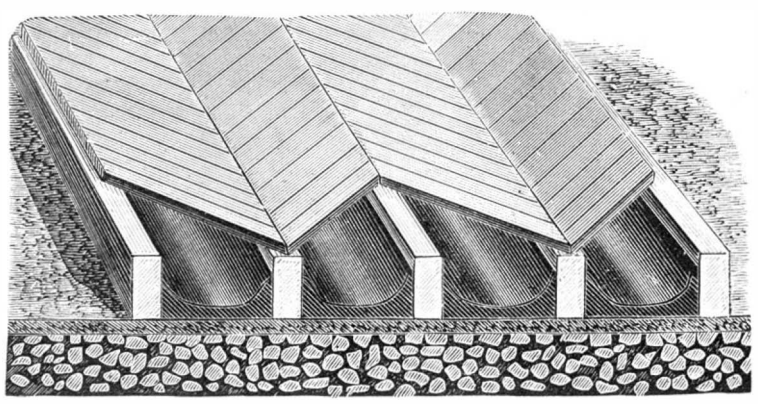

Fig. 8.—JOISTS AND FLOOR UPON A FOUNDATION OF BITUMEN AND CONCRETE.

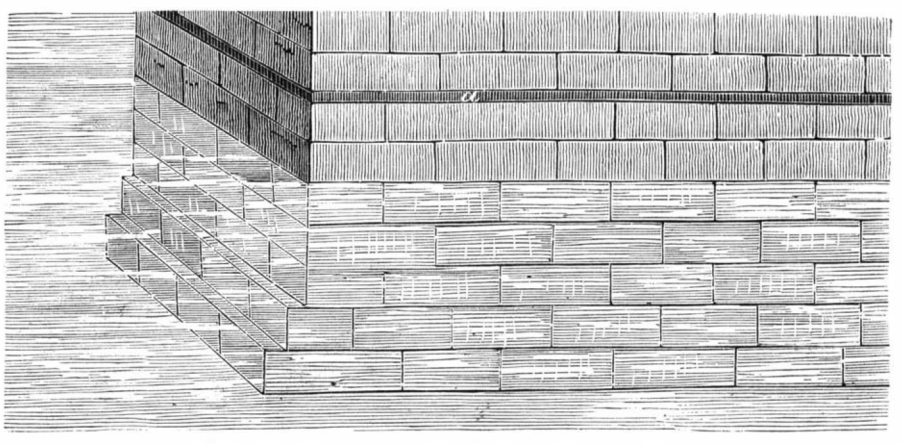

Fig. 12.—WALL CONSTRUCTED IN THE WATER.

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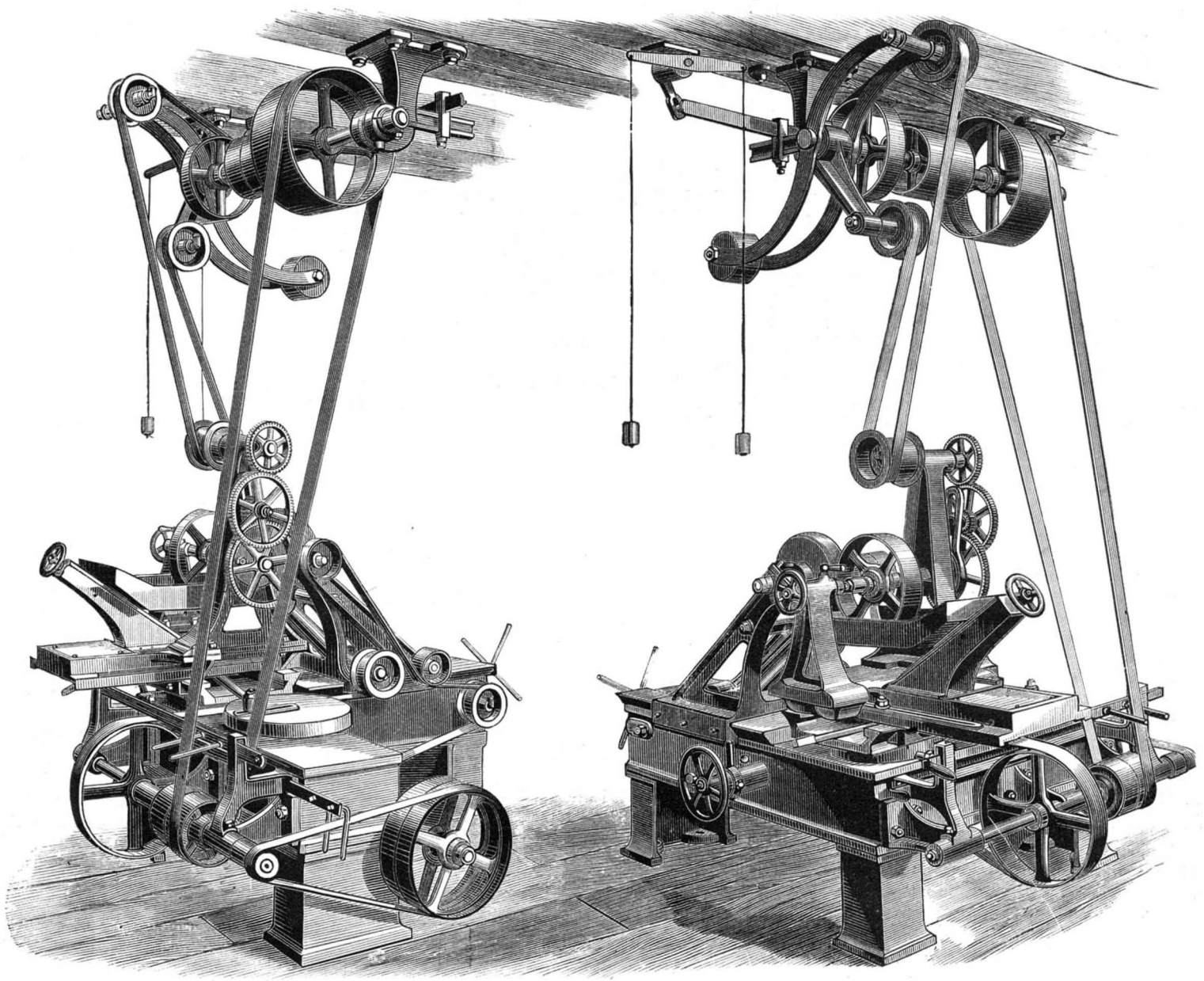

EMERY GRINDING MACHINERY AT THE PARIS EXHIBITION.

EMERY GRINDING MACHINERY.

We take from *Engineering* the accompanying engravings of Handyside's pulley grinding machine, made by Messrs. Thomson, Sterne & Co., of Glasgow.

This machine is capable of grinding pulleys with either straight or curved rims, and all the belt pulleys of Messrs. Thomson, Sterne & Co.'s machines are finished by it. Referring to our engraving, it will be seen that the machine consists of a substantial frame on which are mounted two heads, the one carrying an emery wheel and the other a mandrel on which the pulley to be operated upon can be fixed. The first mentioned head can be shifted to and fro along its bed, so as to enable the emery wheel to be brought to bear upon pulleys of different sizes, and, as will be seen from our left hand view, the driving belt arrangements are such that the tension of the belt which gives motion to the emery wheel is not altered by the head being shifted on the bed.

The second frame or head which carries the pulley to be operated upon has more complicated movements. Thus in the first place the frame carrying the mandrel is adjustable toward or from the emery wheel, so as to bring the center line of the mandrel either directly over the center of the base, or at different distances from that center; secondly, the casting on which the mandrel frame immediately rests is capable of being moved to and fro at right angles to the plane in which the emery wheel revolves; and, thirdly, the base which carries this slide has cast on it a strong hollow vertical cylindrical center to which a reciprocating rotary motion can be communicated. Referring to the left hand view, it will be seen that the transverse movement of the pulley carrying frame is imparted by a connecting rod coupled to an adjustable crank pin in a disk crank at the upper end of a short vertical shaft, this shaft carrying a worm wheel into which a driving worm engages. By this arrangement the pulley to be ground can be slowly traversed to and fro across the emery wheel. At the lower end of the vertical shaft just mentioned is another disk crank with an adjustable pin which can be coupled by a suitable rod with an arm on the bottom of the vertical center with which, as we have already stated, the base of the pulley carrying frame is provided. By the use of this crank alone, or by its employment in conjunction with the other crank, combined with the power of adjustment afforded by the upper side of the pulley carrying frame, such a motion is given to the pulley as to impart to its rim any desired convexity.

The right hand view shows clearly the manner in which the pulley under treatment is mounted on its mandrel, and also the arrangement of the gear by which a slow revolving movement is imparted to the latter so as to bring all parts of the pulley rim successively under the action of the emery wheel. The arrangement of the belt gear for maintaining a proper tension on the belt, while leaving the pulley carrying frame free to move, will be readily understood from an inspection of our engraving without special explanation. One of the great advantages of the machine is that it enables pulleys to be cast much lighter and more nearly to their finished size than would be possible if they had to be turned in a lathe, while when once set it is perfectly automatic in its action.

NOTES OF PATENT OFFICE DECISIONS.

LABELS AND TRADE MARKS.

Parker filed his application for the registration of a label, which he described as consisting of "the figure of a boy, and the words 'Scratch my back,' surrounded by a border of parallel lines, as shown, the figure and the words being formed of numerous squares, printed, and arranged as represented. This label is for use on cards, or sheets of abrasive paper or cloth, and as a pattern for sample work, to be wrought on the squares, in order to so finish the label when desirable. The cards thus labeled are intended for use in firing friction matches."

The question was, Was it a label, trade mark, or design, or should it be copyrighted? One definition given by Webster of a label is about what the Patent Office regards as being the proper matter to be registered as such: "A narrow strip of silk, paper, parchment, etc., affixed to anything, denoting its contents, ownership, and the like, as the label of a bottle or a package." So far as this definition includes fanciful and arbitrary matter, which may be used for the sole and independent purpose of a trade mark, to denote origin or ownership, it is not applicable to matters registered as labels.

Registrable labels or prints and trade marks are recognized by the terms of the law and the decisions of the courts as applicable only to some kind of merchandise; labels as giving the names of the manufacturers, place of manufacture, nature or quality of goods, directions for their use, and the like; and a trade mark as some arbitrary symbol to distinguish the same from those goods of a similar character made by other persons. The courts have always sustained trade marks and labels on precisely the same principles, and they uniformly discuss these matters as having been affixed, in some way, to goods, as merchandise, and not as constituting the merchandise itself. Thus in Moorman vs. Hodge (2 Sawyer, 78) the learned judge, in passing upon an alleged trade mark, stated that he had examined with care a large number of cases involving infringement of trade marks, including all the recent cases which he had been able to find bearing upon the question, and that he had found no case in which the use of an article or package containing it had been enjoined, unless there was some symbol, word, letter, or form impressed or affixed to the article, and which, considered separately from the article or package, was used as the trade mark.

Now the matter which Parker sought to register was not a label, print, or a trade mark affixed to goods or merchandise, to denote ownership, or the character of the goods, and the like, but was the article itself—a fanciful pattern wrought, or to be wrought, into or upon the article—forming part of the article, and giving to it a certain value, by way of a new appearance, like a new pattern worked upon a slipper. It was not designed to be published as a work of fine art, and therefore was not the subject of copyright.

Summing up the case, therefore, so far as above discussed, it was apparent that the subject matter of Parker's application was not a label, print, or trade mark, or the subject of copyright.

The remaining question to consider was whether the design act applied to the case. The law relating to design provides for the granting of patents to those who, among other things, have invented and produced "any new and original impression, ornament, pattern, print, or picture to be printed, painted, cast, or otherwise placed on, or worked into, any article." The Supreme Court of the United States have held that the object of this act was to extend the protection of a patent to the ingenious producer of new and original appearances given to manufactured articles, whereby their salable value was enhanced, and the demand for them enlarged. This appearance may be the result of the peculiarity of configuration or of ornament alone, or of both conjointly.

The Commissioner therefore held that in view of the fact that the subject matter of Parker's application was ornamental in character, and was to be incorporated into the structure of the article, to be a permanent part thereof, it came within the terms and meaning of the design act.

In Hall vs. Atkinson, the testimony showed that about the year 1840 Alexander Calhoun and David Atkinson were a firm engaged in the manufacture of plows; that they devised a plow which met with great favor among the agricultural districts of the South, and this plow soon became known as the "Calhoun" plow. Some time before 1858 Atkinson died, and his widow took his place as a member of the firm. In 1858 Calhoun died, and his place was supplied by John Calhoun. This firm continued to supply the market with the plows in question until about the breaking out of the war in 1861, since which time Mrs. Atkinson had not been engaged either in the manufacture or sale of plows; but the firm of which she was a member leased the right to manufacture these plows, and to use the brand of "Calhoun &

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Atkinson" (the designation stamped upon the plows, although the same were commonly known as the "Calhoun plow"), to H. B. & B., who were succeeded by the firms of B. B. & Co., W. W. B. & Co., and finally by C. & P. From the time of giving up their lease in 1867, H. B. & B., now the firm of James H. Hall & Co., one of the parties to the interference, continued, without any special lease or permission, the manufacture and sale of the "Calhoun plow," and branded their plows in that manner without any opposition from Mrs. Atkinson or her lessees. The evidence further showed that not only this firm but several other business firms in various places had manufactured, without any substantial opposition, plows known by the same name, namely, the "Calhoun" plow. The said Hall & Co. and also Mrs. Atkinson filed applications for the registration as a trade mark of the word "Calhoun" as applied to plows. The acting Commissioner in refusing the registration held that the evidence on both sides clearly showed that the name had ceased to denote origin or ownership of any particular person or firm, but was used extensively by firms to designate a particular plow of a peculiar shape, and known to the public as the "Calhoun" plow, and that hence, having lost its office of pointing out distinctively the origin or ownership of the article to which it was affixed, and having become a generic term in common use as such, it could not be re-adopted by the original owners thereof, or monopolized by any one firm or person.

Iron Direct.

From the *Bulletin du Musée de l'Industrie Belge* we find an article on the Blair direct process of making steel and iron as improved by Mr. Blair and perfected (?) by Mr. Ireland. The main features of the process were the feeding of the broken ore and coal into an upright cylinder and applying heat externally, and as the ore became reduced to metal—deoxidized—it was discharged continuously into an iron prolongation of the cylinder which was surrounded by water to insure rapid cooling. The improvements consist mainly in mixing a small percentage of broken carbonate of lime with the ore and coal in the cylinder, and passing oxide of carbon through and over the charge, thereby gaining about 50 per cent in operating time, and in dividing the iron prolongation of each cylinder into several small ones for the sake of still quicker cooling, and thus lessening the chances of oxidation of the metallic sponge.

A Siemens, Ponsard, or other gas generator is used, and Mr. Ireland, it is said, has worked successfully when using as fuel a poor lignite containing a good deal of pyrites, and without contaminating the sponge, an experience which seems to contradict that of others who have worked in the same line.

Other economical modifications have been made, but the most prominent features—the fundamental principles of the process—are unchanged, and herein, we think, lies the mistake, for if our judgment of the causes of the many failures to attain the object sought by Messrs. Blair and Ireland is correct, the "direct process" can never be a practical mercantile success until by some plan the ore, coal, and reagents are powdered together, so that the reduction of the ore and its required carbonization may be equal and easily regulated throughout each particle, while further economies in time and fuel are effected.

Communications.

Correcting Leading Screws.

To the Editor of the Scientific American:

Noticing in your issue of June 15, 1878, page 373, a method of correcting a leading screw, I was reminded of a plan which I employed some years ago in a similar case. I wished to cut a number of new leading screws having a pitch of 6 threads to the inch. The lathe which I was to use had a leading screw of the same nominal pitch, but on measuring 3 feet of the same I found it too short by $\frac{1}{32}$ of an inch in that length. To make the correction, I proposed to increase the speed of the screw sufficiently to compensate for its deficiency in length. Now $\frac{1}{32}$ of an inch in 3 feet would equal $\frac{1}{32} \times \frac{1}{36} = \frac{1}{1152}$ of the whole length; that is, each thread was too short by $\frac{1}{1152}$ of itself. Consequently if the leading screw should make $1\frac{1}{1152} = \frac{1153}{1152}$ turns to one turn of the screw to be cut, the proper correction would be made.

In order to realize this small ratio with wheels of convenient size I used two pairs of wheels arranged differentially, so that the first pair should gain while the second lost, the former preponderating sufficiently to make the desired correction. The sizes of the wheels were found as follows: Finding $\sqrt{\frac{1}{1152}} = \frac{1}{34}$ nearly, I made two wheels of 34 teeth, one of 33, and one of 35. A 34 tooth wheel is put upon the lathe spindle or "stud," and the 35 tooth on the leading screw. A double "intermediate" is made by fastening the other 34 tooth and the 33 tooth together. Then the 34 on the spindle engages the 33 of the intermediate, and the 34 of the intermediate engages the 35 on the leading screw. The annexed diagram shows both the relative positions and number of teeth of the wheels:

34 lathe spindle or "stud."
|
33—34 intermediate.
|
35 leading screw.

It will readily be seen that the first pair of wheels gain in the ratio $\frac{34}{33}$, and the second pair lose in the ratio $\frac{34}{35}$. The product or resultant of these two ratios is $\frac{34}{33} \times \frac{34}{35} = \frac{1156}{1155}$, which is practically identical with $\frac{1153}{1152}$.

In the case of the Pratt & Whitney lathe mentioned by Mr. Rose, the error was $\frac{1}{36}$ of an inch in 24 inches. Then $\frac{1}{36} \times \frac{1}{24} = \frac{1}{2040}$, and $\sqrt{\frac{1}{2040}} = \frac{1}{45}$ nearly; so the two pairs of wheels would be $\frac{45}{44} \times \frac{45}{46} = \frac{2025}{2024}$, which agrees with the desired ratio, $\frac{2041}{2040}$, to six places of decimals.

As thus described, the device would be useful only for cutting screws of one pitch. To apply the same idea so as to use the ordinary change wheels for various threads, I would furnish the leading screw with a sleeve which slips over the blank end of the screw and rotates on the same. The outer end of the sleeve is fitted to receive the change wheels, while its inner end carries (in my case) a 34 tooth wheel. Close to this wheel, but fixed to the screw, is the 35 tooth. The double intermediate, 33–34, revolves on a stud fixed to the lathe bed. The annexed diagram shows the relative position and arrangement of the wheels and other parts:

——Lathe spindle or "stud."
|
change wheels.
|
Sleeve—34 35—screw.
|
33—34—intermediate.

This method seems to me simpler, both as to construction and calculation, than the one before published.

D. L. F. CHASE.

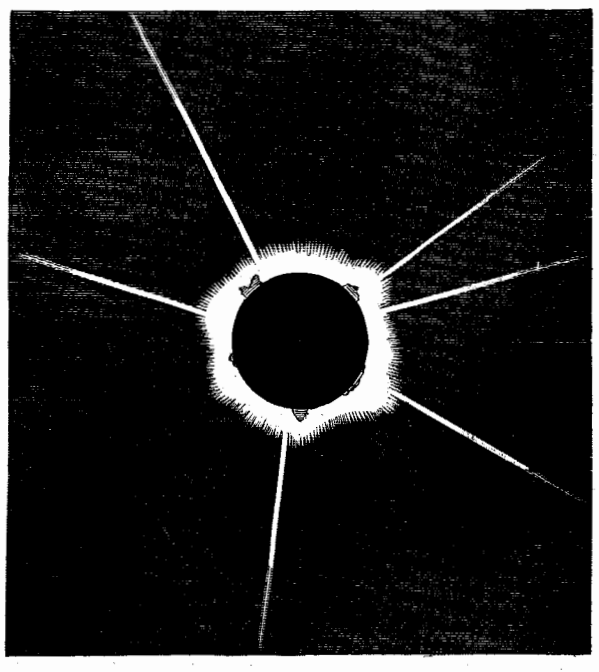
Boston, July, 1878.

Eclipse of the Sun.

To the Editor of the Scientific American:

As your paper is more in the hands of scientific people than any other, I beg to send the following for publication, trusting it may reach observers of the coming eclipse in good time to be of service.

One phenomenon connected with total eclipses of the sun often escapes notice from the fact that, in order to its detection, the eye must have been rendered very sensitive by previous confinement to entire darkness. I refer to the pencils of light shooting off into space through the crevices in the moon's profile. In 1869 there were but three in our party, under Professor Abbe, at Sioux Falls, Dakota, who observed these rays of delicate light.



The drawing I inclose is designed to show the general effect of these rays, not their exact positions, for I made no sketch on the spot. It is always well in eclipse observations to have one or more of the party shut up in total darkness for 15 minutes at least until the instant of the sun's disappearance. I trust some may feel sufficient interest in the appearance here named to give special attention to making drawings of these threadlike rays shooting off into space, like the supporting rays of a spider's web; or rather like silver threads hanging in the heavens the marvelous brooch of a moon of jet set in a corona of purest silver.

A caution given to the writer by Professor Alexander will always be useful to those who are for the first time to observe a total eclipse of the sun—not to let the grandeur of the scene as a spectacle draw their attention from a strict performance of their duties. All who have witnessed such an eclipse will appreciate both the temptation and the necessity for guarding against it.

W. CURTIS TAYLOR.

Philadelphia, July 16, 1878.

Microphone and Telephone.

To the Editor of the Scientific American:

Having put a microphone (one of Hughes' form) in circuit with telephone and battery, I found that when the microphone was submerged in a bucket of water, the ringing of a bell in the water, or the dropping of a nail on the microphone, could be heard clearly and distinctly in the telephone; rubbing on the sides of the bucket, or a slight commotion in the water, near the microphone, could also be heard in the telephone.

During a thunder storm recently, on putting my ear to the telephone (using earth connection), I could hear a peculiar sound, somewhat similar to small sounds transmitted through the microphone every time a current of electricity passed from the clouds to the earth, and *vice versa;* so that the moment the lightning indicated to the eye the passage of the current, the telephone indicated the same to the ear. Breaking and closing the circuit by means of a key, could be heard in the telephone, as when a battery is used, although none was connected with it. On bringing the microphone in circuit, it worked as though a battery was connected with it, but, as previously mentioned, none was used.

The latter phenomena continued throughout the following day, which was partially cloudy.

WM. S. ALDRICH.

Burlington, N. J., July 9, 1878.

The Sutro Tunnel.

The telegraph reports that on the night of July 8th, at 11 o'clock, connection was made between the Sutro Tunnel and the 1,650 foot level of the Savage mine; that a strong draught of air at once poured into the mine, and, heralded by this welcome breeze, Mr. Sutro himself entered from the tunnel, and a general jollification ensued. The recent agreement between the Sutro Tunnel Company and several leading Comstock mining companies, though it does not, as we understand it, include the mines now producing ore, is a very important and auspicious arrangement for all parties. Nothing is more certain, if we may judge of the future by the past, than that every mine on the Comstock will sooner or later be obliged to pass through another period of non-production and costly and difficult exploration. At the present depth and temperature of operations the Sutro Tunnel will be a necessity to every mine in that condition, and in most cases the companies will have to make terms with Mr. Sutro or abandon their work. From this time he commands the situation. We congratulate him on the triumph, which is so largely due to his individual energy and perseverance. The only pity is that the great adit has been delayed and rendered more costly by discord among the parties who should have been most deeply interested in its success from the beginning. The mines should have controlled the tunnel. Now it looks a little as if the tunnel were destined to control the mines.

By the way, how would some of our friends among the Comstock superintendents like to peruse again the testimony they gave on this subject, a few years ago, before the Committee on Mines and Mining of the House of Representatives? Are we dreaming, or did we not hear, on high practical authority, that the Sutro Tunnel would never be completed; that it would do no good if completed; that it would not be needed for drainage, because there was so little water in depth; that it would not assist ventilation; that ventilation was good enough, anyhow; that it could never transport ores, etc., etc.?

It is a long road still, and we will not say an easy one, to the fulfillment of all Mr. Sutro's hopes. Whether ores will be taken through the tunnel, to be concentrated and reduced on the Carson, is a question involving many complicated interests, as well as technical difficulties. Of the latter, one of the most serious appears to be that if the tunnel proves greatly useful in ventilating the deep workings and reducing the temperature, it may not be thought advisable to impair its efficiency in this respect by choking it with trains of cars. It still remains to be determined in what way it can be made most useful, and how many functions it can successfully discharge at once. But there can be no doubt that, in one way or another, it will be the salvation of the deep workings on the Comstock lode.—*Engineering and Mining Journal.*

New Agricultural Inventions.

George Washington Grimes, of Bluffton, Indiana, has patented an improvement in the Combined Drill and Planter, for which letters patent No. 199,200 were granted to him January 15, 1878, which makes it more convenient, more effective, and better adapted for different kinds of planting.

Hazen R. Underhill, of Derry, New Hampshire, has patented an improved Double Mould Board Side Hill Plow, which is so constructed as to be available in any ordinary plowing. It is easily adjusted to turn the furrow in either direction.

Charles Daniel, of Virginia, Missouri, has patented an improved Plow Colter, that is adapted to reversible or hill side plows. It consists in a cutting wheel that is journaled in a swiveled support and attached to a sleeve on the plow beam, said sleeve being provided with a latch that engages a notched collar on the beam.

John A. Perry, of Carthage, Alabama, has patented an improved Churning Apparatus, which may be used with ordinary churns without any change whatever in said churns. It is effective in operation, bringing the butter quickly, developing all the butter there may be in the milk, and gathering the butter so that it can be readily removed.

An improved Field Roller has been patented by Thomas B. Rice, Jr., of Medora, Ill. The invention consists of a field roller made of one, two, or more independent sections, that turn by end gudgeons in slotted holes of the supporting frame, and in chain supported center links. Each roller section is connected by chains or belts with pulleys of the frame, so as to run lighter by the action of the chains.

Aaron Rosier, of Sussex, Wis., has patented an improved

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Double Tree Clevis, which is so constructed that should one of the horses of a team get behind the other the clevises will adjust themselves automatically to give the rear horse an advantage of leverage to enable him to regain his place at the side of the other horse, when the draught again becomes equal.

Charles R. Polen, Sr., of Hazel Dell, Ill., is the inventor of an improved Machine for Pulverizing the Soil to prepare it to receive seed, which is simple, convenient, and easily kept in repair. It leaves the soil level and smooth, and in good condition to receive seed.

Ira O. Childs, of Shreve, Ohio, has patented an improved Hedge Fence, which is close and thick in its lower part, so as to prevent the passage of small animals, and which may be allowed to grow to any desired height, and may be trimmed in any shape.

NEW POWER PRESS.

We illustrate herewith a new inclined double eccentric press made by the Stiles and Parker Press Company, of Middletown, Conn. This press is designed especially for such work as the tops and bottoms of large square cans, such as are used for packing kerosene oil. Two tops or two bottoms are made at the same time, one at each side of the press. The workman puts in one piece with each hand, and, as the press is inclined, the finished articles drop out of their own gravity.

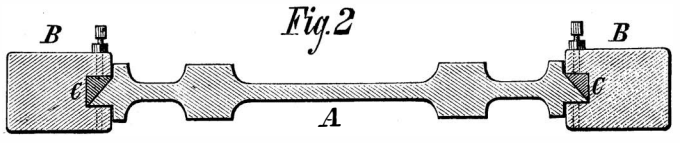
The transverse section, Fig. 2, is taken through the slide and guides, showing the manner of gibbing the slide to take up wear.

Owing to the inclination of the guides, the slide tends to wear on the rear or under side. To keep the slide always true with the bed the gibs are located on the lower side, and can be adjusted to compensate for wear by means of the set screws in the guides. The part of the slide, A, that is fitted to the ways, B, is beveled, and the triangular gib, C, is fitted to the ways and slide, and is adjusted by the set screws in the ways. This arrangement is said to work very satisfactorily.

Another important feature in this press is the device for simultaneously adjusting both pitmans.

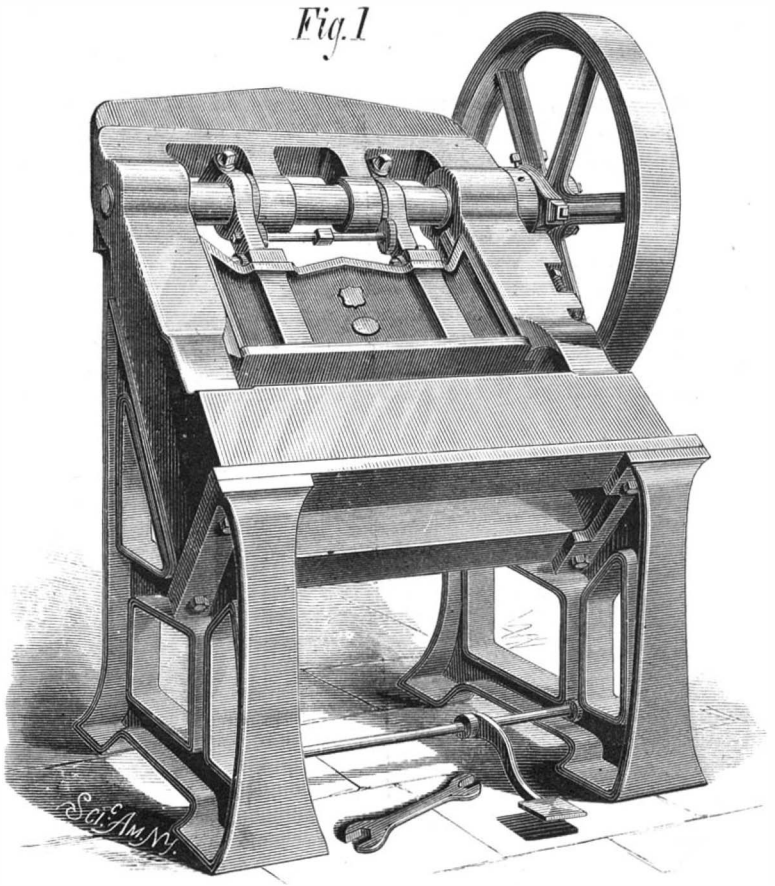
The manufacturers state that all of the bearing surfaces are scraped to a fit, and that the workmanship and materials are of the best quality throughout. For further particulars address the manufacturers as above.

Fig. 2



INCLINED DOUBLE ECCENTRIC PRESS.

Fig. 1



INCLINED DOUBLE ECCENTRIC PRESS.

No Credit.

Thirty-seven firms, located in different parts of the oil country, and embracing all those engaged in the manufacture of oil well tools from the upper to the lower district, believing, from their vast experience and observation, that the credit system is alike disastrous to both the producer and manufacturer, announce that on and after to-day (June 10) they will sell their goods only for cash on delivery. Commenting upon this the Titusville *Herald* says: "There is no break in their ranks and no dissenting voice. The evils of the credit system are so widespread that this step had become necessary, and the cash system will work good not only to the trade, but to the producer as a class. The facility of giving and getting credit has stimulated production and offered a premium not only to financial looseness, but to actual dishonesty. The cash system will make all more conservative in their operations, and if dealers can avoid bad debts and doubtful credit, prices will in the end decline to a level consistent with legitimate business profit, and the whole country will be the gainer."

Decline in the Price of Petroleum.

Great consternation has been caused in the oil regions of Pennsylvania by the recent decline in the price of petroleum to less than a dollar per barrel. It is generally admitted that these ruinous prices are a natural and unavoidable result of the immense overproduction, and in some quarters the belief is expressed that if there is no other way of curbing the desire to sink new oil wells more rapidly than new markets can be found, a still further decline will in the end prove beneficial by warning all whom it may concern of the folly of glutting the market with excessive quantities of such a product as petroleum.—*Railway World.*

New Inventions.

Silas S. Crocker and Albert Wilcox, of Clarence, Iowa, have invented an improved Foot Bath for Horses, by means of which a horse's feet may be bathed while he is standing in a stable, so as to prevent his feet from being injured by remaining too long dry.

Albert Ferguson, of Brooklyn (E. D.), N. Y., has patented an improved Sportsman's Lantern, which may be secured in a substantial manner to the hat of the sportsman, so that it will not restrict his movements, and will throw the light directly forward upon the game, leaving the sportsman in the shade.

Henry S. Cate, of Millerstown (Barnhart's Mills P. O.), Pa., has patented an improved Chair Seat and Back, which consists in a piece of elastic rubber placed between the seat or back and the chair frame. The rubber is continuous, and gives a degree of spring that furnishes a comfortable yielding support to the body, is more economical than springs or stuffing as usually employed, and is withal of sufficient strength to be very durable.

Abe O. Kaplan, of Cincinnati, O., is the inventor of an improved Satchel Desk, having an interior casing that is subdivided and provided with a hinged and folding desk portion, and with sliding and swinging corner receptacles for inkstands and similar articles. The folding desk closes the casing, and is covered by the lid of the satchel, to the center bar of which the handle is applied, the lid being locked at both sides and strapped to the body of the casing by suitable locking devices.

William [illegible]. Bowen, of Ridgeway, Iowa, has devised an improved [illegible]ting Drum for attachment to stove pipes, which will also serve as a stove shelf. It consists in two conical end sections and a flat middle section connected with the end section by short pipes, leaving a space between the sections for articles to be heated.

William M. Ryerson, of Newton, N. J., has patented an improved Harness Saddletree, which prevents the saddle from injuring the horse's back or coming in contact with his back bone, so that his back will not be made sore, and will be allowed to heal while he is in daily use, should it have been previously injured.

Frederick Buehrig and Charles Buehrig, of Fort Madison, Iowa, have patented an improved Lamp Burner, that combines the advantages of a common lamp burner with those of a night lamp, and furnishes either a flame of the usual size or a night light, admitting the changing of one light to the other in an instant without the use of a match or the handling of the chimney, the night light being, furthermore, protected by the chimney, so as not to be blown out when being carried about.

An improved Vapor Bath has been patented by Mrs. Carrie A. Munro, of Salt Lake City, Utah Ter. The invention consists in a box of peculiar form, having neck apertures for both the sitting and reclining postures, and containing a removable cot, a stool, and vaporizing apparatus, which cannot be clearly described without engravings.

An improvement in Chills for Hubs has been patented by Patrick H. Burns, of Indiana, Pa. This invention relates to chills for chilling the hubs of wheels, more particularly the hubs of car wheels, such as revolve on their axles; and it consists in a cylindrical chill having end pieces for chilling the cheeks of the hub, and having a portion at the middle reduced in diameter and grooved circumferentially to receive an annular core, which forms a chamber in the hub. The chill is provided with several transverse and longitudinal vent holes for the escape of gas generated in the core.

Martin Entenmann, of New York city, has patented an improved Game Apparatus, which consists in the combination of a stationary horizontal disk provided with series of numbered perforations, and a concentric subjacent rotating wheel provided with a vertical rim, and having projections arranged to dislodge, by rotation, a number of balls resting in the holes of the said disk.

Francis P. Cummerford, of Wilmington, Del., has patented a Protecting Helmet for the use of firemen, shipwrecked and other persons. It is made of rubber, or other elastic material, that closes tightly to the neck, but fits loosely on the head, it being provided at the upper part with a ventilating device, and with a mouthpiece and closing device to admit of speaking.

Jonathan Hill, of New York city, has patented an improved Take-up for Twine Holders, which will raise the free end of the twine from the counter after it has been detached from the bundle being tied. It consists in a tube having at its upper end a ring, by which it is suspended, and having at its lower end a ring for supporting the twine basket or holder, and containing a sliding weight, which is provided with an eye that receives the twine, which passes through eyelets in the opposite sides of the upper end of the tube.

Edward L. Witte, of White Mills, Pa., has patented an improvement in Methods of Labeling Bottles, which consists in first burning the colors into the label and then melting the label into the bottle.

Elida M. Capen, of Charlton Depot, Mass., has invented an improved Index Tag for Books. It consists in a metal tag which is split lengthwise, so as to form two clamping jaws, that are caused to gripe the edge of the leaf of a book by means of a prong or rivet.

Henry S. Wood, of Rob Roy, Ark., has patented an improved Lap Ring, which consists of a lap ring made of two sections, which are open at one side, and provided with grooved center pieces at the opposite side, that fit into the openings, so as to firmly interlock when connected with each other.

David H. King, of New York city, has invented an improved Newspaper File for securing the parts of a paper or several papers together in such a way that they may be conveniently handled and read without getting out of place, and which at the same time may furnish a means for hanging them up, if desired.

An improved Horse Brake has been patented by Israel Spitz, of Chicago, Ill. The object of this invention is to furnish an improved device for controlling or braking horses, so as to prevent them from running away, and bringing them instantly, in case of danger, within the power of the driver or rider.

Frederick G. Hunter, of Moncton, New Brunswick, Canada, has patented an improved Seal Lock for railroad cars, mail bags, and other purposes, which may be applied to the hasps quickly and conveniently, so as to lock the same securely, without any chance of being tampered with, the seal lock being readily used again after the tin seal is cut and the lock opened.

John Edgar, of New Bloomfield, Pa., is the inventor of an improved School Desk, which consists in a book box pivoted to slides and having means for adjusting and fastening it; having also a shelf or adjustable top, and levers and sectors and catches for holding the parts in position.

Frnest T. Gennert, of New York city, is the inventor of an improved Drying Kiln, which is designed especially for drying beets for sugar making, but which may be used with equal advantage for drying various other substances.

John Homrighous, of Royalton, Ohio, has patented an improved Burial Casket, which may be adjusted to any length, so as to enable the undertaker to keep on hand a full stock without being obliged to keep on hand as many caskets as are required by the present sizes.

Silas Robbins, of Monroeville, O., has patented a Bag Holder for holding grain and other bags to allow them to be conveniently filled. The device is in the nature of a bracket having such construction and provided with such devices as adapt it to be readily attached to and detached from a suitable support. The bag is held by friction with a hoop which is pivoted to the bracket.

Moses M. Rice and Jesse Labar, of Slatington, Pa., have patented an improved Desk Slate Holder. It consists in a desk having a divided and hinged top, in which there is a recess containing a hinged frame, in which is pivoted the slate.

William Haas, of Walla Walla, Washington Ter., has invented an improved Mop Wringer, for attachment to the side of a tub, pail, or bucket. It is constructed to enable the mop to be easily, quickly, and thoroughly wrung out without its being necessary to wet or soil the hands by touching it.

Michael W. Scannell, of Williamsport, Pa., has invented an improved Kitchen Sink, that is arranged in such a manner with a strainer and plug as to be used either as a sink or as a basin to hold water for washing dishes, etc. The strainer is so arranged as to be readily removed for cleaning, while the overflow is conducted off through suitable openings and exterior pipe.

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David C. Delinger, of Red Oak, O., has patented a Road Gate, adapted to swing horizontally, and operated by cords and levers, the latter being extended from the pivot post laterally or parallel to the roadway, so that the cords which are pendent therefrom may be seized by persons on horseback or in carriages, without dismounting. The improvement relates to the construction and arrangement of the devices for operating the gate.

NEW PORTABLE MILL

We present herewith an engraving of a patent portable mill, made by Messrs. Munson Brothers, of Utica, N. Y. In the engraving A is a cast iron frame, on the upper part of which there is a cylindrical shell, B, to receive the runner or understone. This shell is of larger dimensions than the stone, so as to leave a space all around and underneath the stone, as shown in Fig. 1. The shell, B, is cast in the same piece with the frame, A, and has its upper edge made perfectly smooth and even, so that all parts of its surface will be in the same plane.

In the lower part of the frame, A, there is a horizontal driving shaft to which is secured a bevel wheel, which gears into a bevel pinion on the spindle, C, the lower end of which is stepped in a socket, D, the upper end of which has a flange around it. This socket is fitted within an adjustable box, which rests upon a lever supported by a nut and screw, by which means the stones may be made to run at a greater or less distance from each other to vary the fineness of the flour.

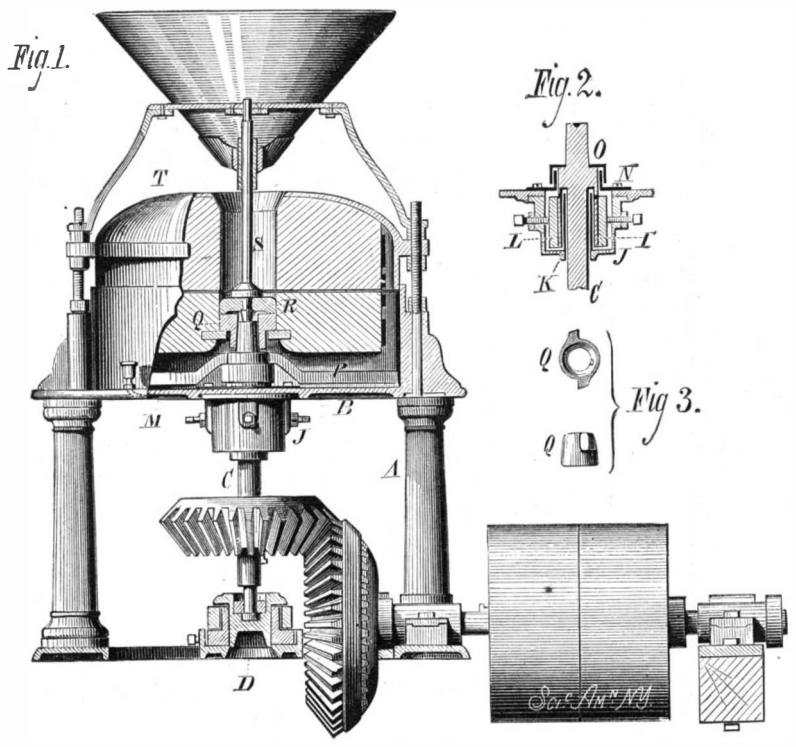
The spindle, C, is provided with a collar, I, Fig. 2, which is fitted within a box, J, attached to the underside of the shell, B. The box, J, is of cylindrical form, concentric with the shell, and within it there are placed bearings, L, which are adjusted snugly against the collar, I, by keys, screws, or other means. The collar, I, is hollow and opened at its lower end, having a space all around between it and the spindle. The box, J, is provided with a central vertical tube, K, around which the collar, I, works, the tube, K, passing up between the collar, I, and the body of the spindle. The upper part of the collar, I, is perforated with holes, which are just above the bearings and below the upper end of tube, K. M is a tube which extends along underneath the shell, B, and communicates with the upper part of the box, J. This tube forms a means of supplying the box, J, with oil. The collar, I, forms the bearing surface of the spindle.

The box, J, is covered by the cap, N, having a circular flanged aperture in its center to allow the spindle to pass through. A cap, O, on the spindle, C, covers the flange of the cap, N. On the upper end of the spindle, C, there is placed a clearer, P. This clearer is formed of two arms attached to an eye, which is fitted on the spindle and secured thereto by a feather and groove. The arms of the clearer extend nearly to the side of the shell, B.

The driver, Q, is fitted on the upper part of the spindle, and like the clearer is secured to the spindle by a feather and groove. The driver rests on the eye of the clearer, and has two arms which fit in recesses in a shell, R, which is secured concentrically within the understone or runner, and has a bearing which rests upon the apex of the spindle. The dansel, S, is attached to the upper surface of the shell, R.

The upper stone is secured in a cast metal cylindrical box, T, which is turned true at its lower part so that it may fit into the shell, B. The upper stone has a central eye, and the box, T, is secured in proper position by means of screw rods and nuts; the rods are attached to the shell, B, and pass through eyes at the outer side of box, T. A hopper frame is placed on the box, T, for supporting the hopper and shoe, which may be arranged as usual. It will be seen from the above description that the runner will, in consequence of the arrangement of the driver relatively with the apex of the spindle, be allowed to adjust itself to the stone, so that the parallelism of the faces of the two stones may be preserved as the stone rotates. This arrangement, to wit, the having of the apex of the spindle in line with the bearing surfaces of the arms of the driver, admits of a universal joint movement of the stone, an effect which cannot be attained in the ordinary arrangement.

This invention also enables the spindle to be always kept properly lubricated, as oil may be poured into the box, J, at any time, and the oil in the box is retained therein, in consequence of the perforations in the upper part of the collar, I. These perforations cause the oil, which may have a tendency to rise in the space between the tube, K, and the collar, I, to pass the holes into the box, instead of passing over the top of the tube. This is an important feature in this invention, as it effectually prevents the escape of the oil from the box, J, when the latter is not oversupplied. For further particulars address Messrs. Munson Brothers as above.



NEW PORTABLE MILL.

THE NEW SPANISH PROCESS FOR SILVER AND COPPER.

The new Spanish process for the chlorinization of silver and copper ores, which dispenses with preliminary roasting, seems to be better fitted for laboratory determinations than for work on the large scale required in mining operations It consists in treating the pulverized ore with a solution of common salt, to which are added nitric acid and manganese ore, and the chlorinization and lixiviation are effected in filtering casks, and occupy from 12 to 24 hours.

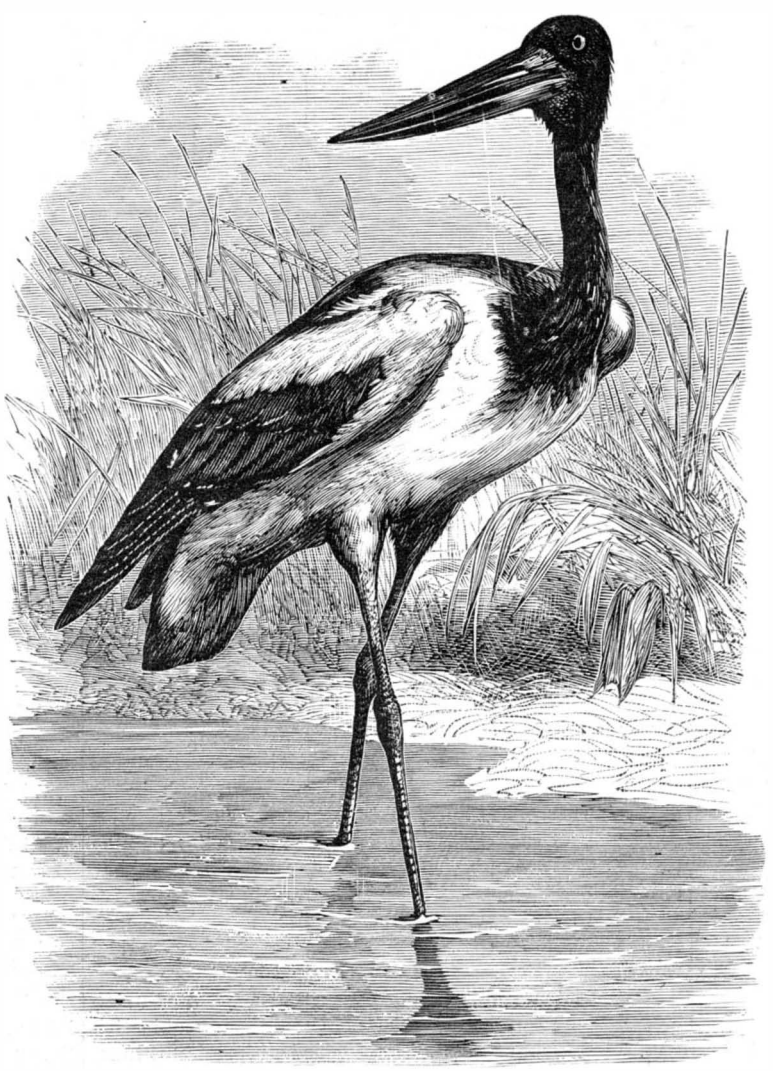
In the process most commonly in use with us the oxidation of the sulphur, arsenic, etc., is effected by fire, which is certainly much more economical than nitric acid, and the roasted ore is chlorinated and lixiviated in larger quantities and in less time; while by still another process the finely powdered ore is made to fall, with a sufficient supply of air, through an upright shaft furnace, heated sufficiently for the ignition of the sulphur (and a moderate percentage of sulphur maintains the heat and combustion without further supply of fuel), into a hot bath of salt and water, while the decomposition of the salt is effected and the chlorine liberated to attack the silver and copper by wetting down the sulphur fumes on their way up the stack and returning them to the bath. The method of recovering the metals is alike in each instance. This Spanish process is apparently but a modification of, not an improvement on these which we have mentioned, and we think it will be difficult, if not impossible, to evolve a chlorinating process better adapted to the requirements than these, either in theory or in practice.

THE AUSTRALIAN JABIRU.

The Jabirus rank among the giants of the feathered race. There are very few species known, and they all seem to have similar habits—hunting on the borders of lakes, marshy grounds, and banks of rivers, where they find abundance of fish and aquatic reptiles on which they feed.

The Australian Jabiru appears to be a very rare bird, and it is extremely wary and haunts wide expanses where but little cover can be found. It can with difficulty be approached. To shoot one is a difficult task. A good sportsman, who succeeded at last in killing a jabiru, followed it for several days before he could get within long range of the suspicious bird. Dr. Bennett in his "Gatherings of a Naturalist in Australia" gives an interesting account of one of these birds which he tamed.

In its coloring the Australian jabiru is a very handsome bird, and its movements are quiet, majestic, easy, and graceful. The large head and neck are rich, shining green, changing to rainbow tints of violet and purple upon the back of the head, the feathers gleaming in the sun with light metallic radiance. The greater wing coverts, scapularies, lower part of the back, and tail are dark brown mixed with rich bluish green, which changes in the adult to a rich, glossy green tinged with a golden luster. The smaller wing coverts, lower part of the neck and back, and upper part of the breast are white, speckled with ashy brown, but become pure white in the adult; the lower part of the breast, thighs, and inner part of the wings white; eyes brilliant hazel in color. The legs are blackish with a dark tinge of red, becoming of a bright red color in the adult; and when the bird flies with the legs stretched out, the legs look like a long red tail. Dr. Bennett's specimen measured three feet and ten inches to the top of the head, but was not full grown; they are said to attain a height of four or five feet.



THE AUSTRALIAN JABIRU.

New Engineering Inventions.

John Tregoning, of Brooklyn, N. Y., has patented an improved Steam Valve for pumping engines, which consists in a circumferentially grooved piston rod, which acts as a valve, and in passages that lead from the ends of the valve chest to and across the cylinder heads, and to the exhaust receiver of the cylinder, the said passages being crossed between the valve chest and cylinder heads.

John Tregoning and Michael Hastings, of Brooklyn, N. Y., have jointly patented an improved Pump Valve, which consists in a semi-cylindrical valve fitted to a suitable valve seat, and provided with recesses in each end for receiving a head formed on the rod of a small piston. A piston is connected with each end of the valve, and works in a chamber or cylinder formed at the end of the water way in the valve seat. Communications relating to either of these two inventions should be addressed to Mr. John Farrell, No. 20 Water street, Brooklyn, or to Mr. John Tregoning, 38 Gold street, New York city.

James C. Thomson, of Barnhart's Mills, Pa., has patented an improved Vacuum Packer for oil wells, for shutting off communication between the upper strata of rock and the oil bearing rock, and it consists of three apertured metallic disks placed on the well tubing, and arranged to receive the vacuum tube, which, by its weight, compresses a rubber packing disk vertically, so as to expand it laterally to fill the bore of the well.

William Taylor, of Peekskill, N. Y., has patented an improved Gate for Patterns, which consists in a gate formed of easily fused metal, interlocked with a pattern having countersunk holes or dovetail slots, or both. Patterns attached in this manner are not easily broken from the gate in the operation of ramming the mould or rapping the pattern, as is the case with patterns made wholly from cast iron; and the patterns are attached at a trifling expense compared with the usual method of riveting them to wrought iron gates, besides giving the gate a better form for moulding and for detachment from the casting.

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ZOOLOGICAL GARDEN AT FAIRMOUNT PARK, PHILADELPHIA.

Fairmount Park has attained a reputation which is second only to that of Central Park, New York. It contains nearly 3,000 acres, being more than three times as large as Central Park. It is dedicated to be a public pleasure ground forever, and under the management of a Board of Commissioners it is rapidly growing in beauty and interest.

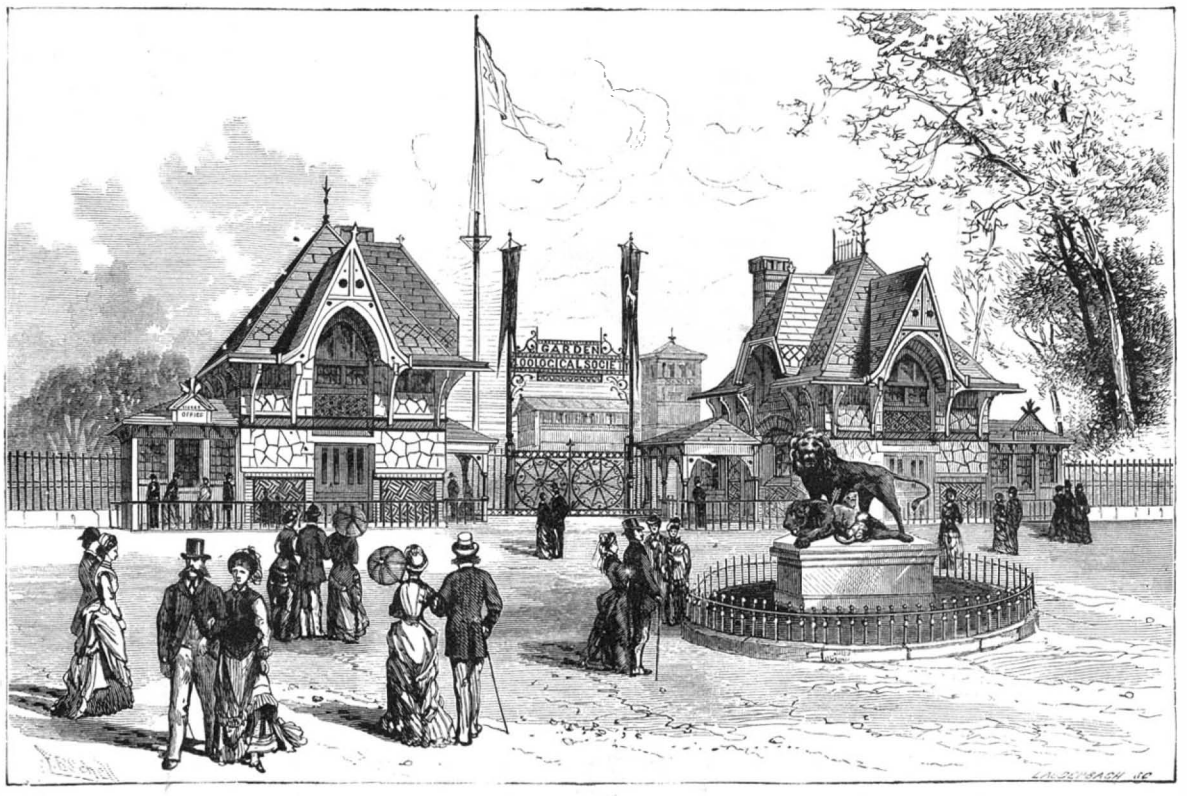
Thirty-three acres of the park have been leased by the Zoölogical Society, of Philadelphia, which has been so successfully managed that, although but a few years old, its collection is the finest in this country.

The tract of land leased to the Society is that known as "Solitude," and on it stands the ancient house built by John Penn, son of Thomas Penn, and grandson of William Penn, and owned by his descendants until purchased by the Park Commissioners.

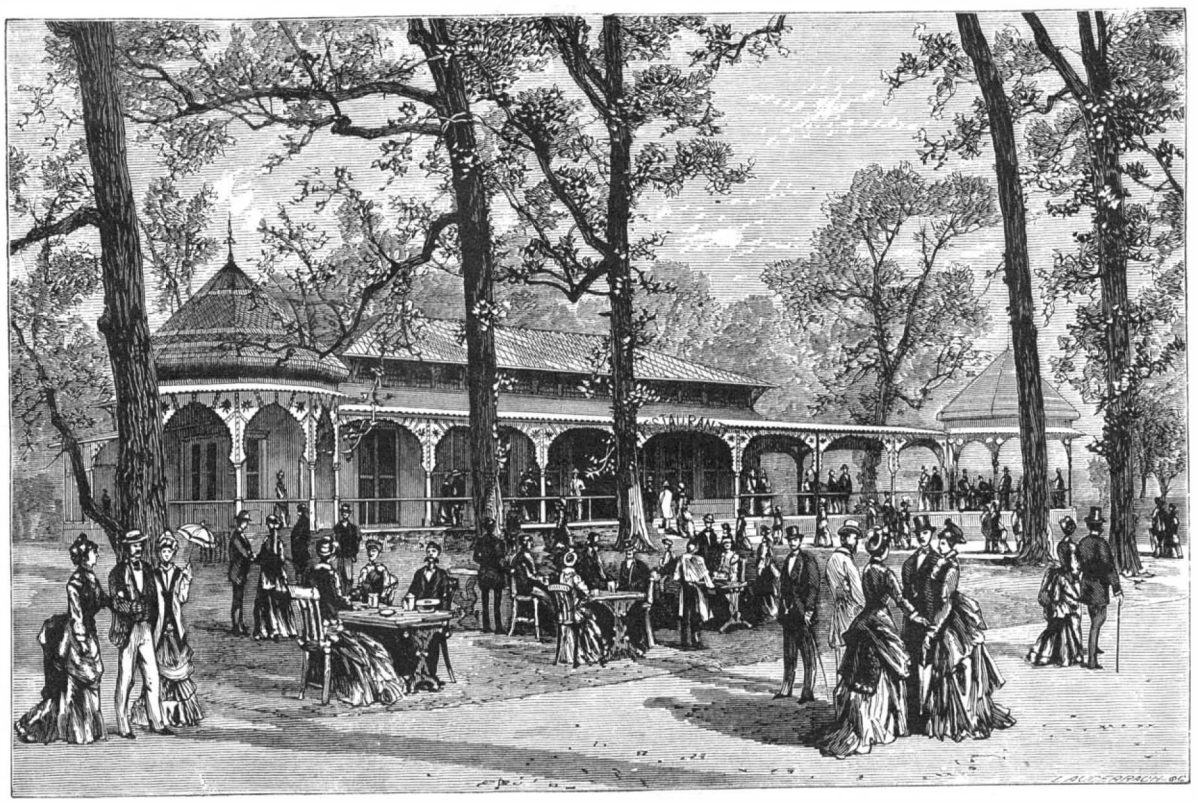
No expense has been spared to perfect the garden in every particular, and it is fitted in a manner best suited for the maintenance and exhibition of birds and animals.

The Society intends establishing here a zoölogical garden, second to none in the world, and is rapidly carrying out its designs. It has agents in every part of the globe from whom it receives frequent shipments of rare and interesting specimens of natural history.

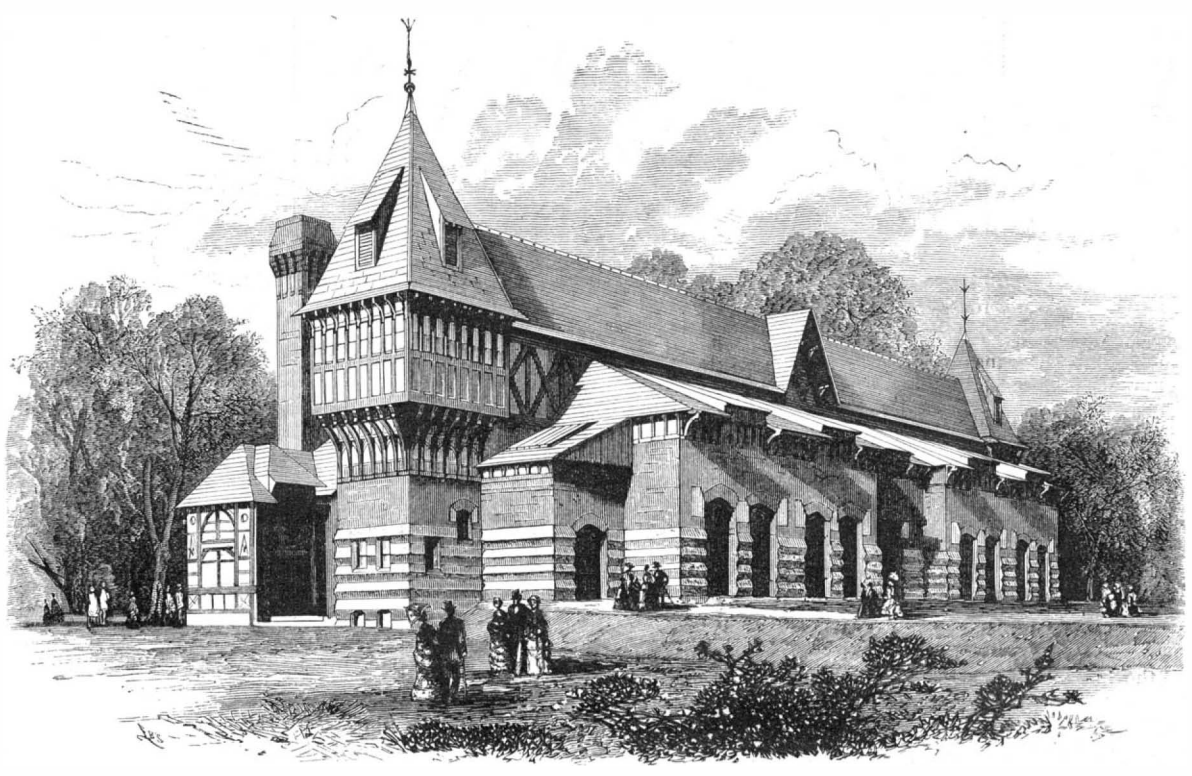
We present herewith engravings of the Girard Avenue Entrance, the Restaurant, and the Elephant House, which are all substantial buildings and fine specimens of architecture.



GIRARD AVENUE ENTRANCE.



THE RESTAURANT.



THE ELEPHANT HOUSE.

Solubility of Cotton.

In my operations in carbon photography, and with dry collodion, in which films of normal collodion are employed, I have used, with some advantages, ordinary cotton in solution in ammonia at 22°, containing fifteen per cent of hydrated carbonate of copper.

In the rapid albumen dry process it is necessary, before applying the albumen to the plate, to cover it with collodion, which forms a kind of spongy felt, capable of retaining a greater quantity of albumen and of equalizing the film.

The soluble cotton prepared by me, according to the directions of Major Turainne, has given me satisfactory results. It is not so easily used as the alcoholized ether collodion, but it costs much less. I prepare it in the following manner: In ammonia at 22°, containing fifteen per cent of hydrated carbonate of copper, after the reaction has ended I add to the liquid (in small quantities) ordinary cotton, free from greasy matter, such as is used for the preparation of pyroxylin; I agitate, and after solution I filter through asbestos, or I decant after repose in a glass-stoppered bottle, as this product is highly caustic. If we desire to obtain a cotton adhering more strongly to the plate, or opaline films, add to the caustic solution a little resin.

To cover a plate, I collodionize in the ordinary manner, and when the coating is thoroughly dry I immerse the plate in a dish of water acidulated with azotic acid. The blue print produced by the copper salt rapidly disappears, and a few washings suffice to leave on the surface of the plate, after thorough drying, but a highly adherent coating of pure cotton. The coating of cotton, after the last washing, while still wet, may be covered with albumen, or the plates may be prepared beforehand and again wet before albumenizing. The coating may also, after the final washing, be covered with iodo-bromide solution, allowed to dry or drained only, and then plunged into the silver bath. The plates thus prepared are very sensitive.

Seen under a magnifying glass, the tissue formed by ordinary cotton is precisely like that produced by emulsions. The ammoniacal solution of copper has been known for a long time as a solvent of cotton, and I am surprised that this property has not been already utilized in photography, as I believe it susceptible of many applications.—*Ernest Boivin, Moniteur.*

Phosphor Bronze.

The superior durability of phosphor bronze over other material for bearings, slide valves, and various other purposes where hardness and toughness are requisite is strikingly illustrated in an exhibit at the Paris Exposition, wherein are shown many bearings, etc., of the bronze side by side with those of other metals with which they had been used in competitive tests. Bronze bearings used for finishing rolls in a rail mill show very slight wear for eight months of constant work, while gun metal bearings on same rolls wore out in three weeks.

Bronze bearings were used on one side and gun metal on the other of crushing rolls, making 120 revolutions a minute, with a pressure upon them of 2½ tons; the first showed scarcely a sign of wear, while the latter were completely worn out.

But the most remarkable instance is that of locomotive slide valves, which, though in use for twenty-two months, have required no attention in the repair shop and have worn but $\frac{1}{32}$ of an inch, while the life of ordinary gun metal slides averages but eight months; and the cylinder faces on which the valves slide were not worn in the least. At this rate of wear the life of the bronze valves would be from seven to eight years.

It is evident that in the phosphor bronze we have an agent for very materially reducing the "repair account" on our railroads and in our manufactories—a most welcome matter in these times.

A DEEP GAS WELL.—Operations on the Tarentum oil well, near Pittsburg, were lately stopped. The well is down some 2,300 feet, at which depth no oil was obtained, but a good supply of gas has been secured, sufficient to run any large manufacturing establishment.

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SHEET METAL WORKING PRESSES.

Our extract from Knight's "New Mechanical Dictionary"* contains several varieties of presses used in sheet metal working. In Fig. 1 a sheet of metal is inserted between the ring, *o*, and the fixed annular die, *f f*; the intaglio die, *d*, then advances, and its edge acting against *f f'* cuts

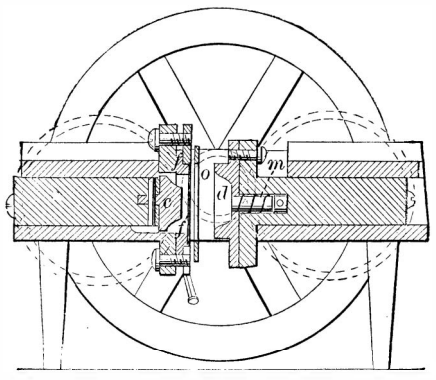

Fig. 1.—Machine for Forming Sheet-Metal Basins, etc.

out a blank, which is then struck into the die, *d*, by a forward movement of the cameo die, *c*; as *d* recedes the article is forced out by a follower, *m*.

In Fig. 2, the intaglio die, *d'*, is attached to a yoke connected with the two rods, *c c*, through which it is depressed by the operation of a treadle and connecting devices; on arriving at its lowest position it is temporarily prevented from rising by a rod, Q, engaging over the treadle; when the rod is pushed aside springs restore the treadle to its normal position, and the die again rises. The dies are provided with lateral as well as vertical adjustment.

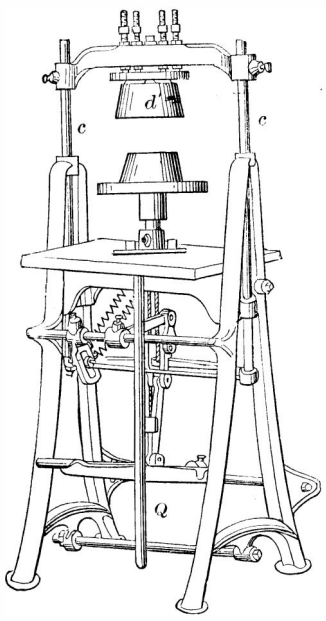

Fig. 2.—Stamping Machine.

Fig. 3 is designed for stamping forks, spoons, and similar articles. One die, as B, is hollowed at the part which forms the bowl or prongs, and the other, A, at the part which forms the handle, the object being to form as small a burr as possible, and that at the angles instead of centrally. The lower die is vertically adjusted upon wedges operated by set screws. The die holder is used in connection with an ordinary fly or other press.

Machinery for making seamless articles from sheet metal by stamping was devised in France as early as 1840. The first attempts, which were partially successful, were made with the drop press. This, however, it was thought, did not allow sufficient time for the metal to assume the required form without tearing, and the screw press was substituted for it, giving better results. The cam press has also been generally used in France, which has long maintained a preeminence in wares of this kind.

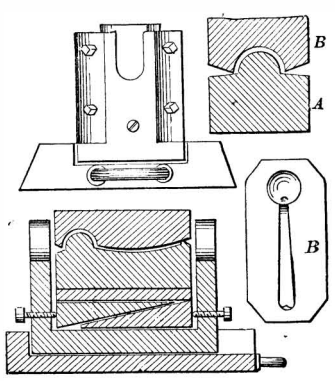

Fig. 3.—Machine for Stamping Forks, Spoons, etc.

Vessels are manufactured from sheet iron, the depth being given at several successive pressings, depending on the depth of the article. The metal is annealed after each pressing, and is finally turned. Such articles are now manufactured in this country from tin plate, annealing being dispensed with, and the goods are prepared ready for market without re-dipping.

Fig. 4 illustrates a machine for forming pans or kettles from blanks. There are several moulds for each pan, the operation being a progressive one; deeper and deeper moulds being used successively so as to stretch the blank more and more, to avoid the tearing which would result from the attempt to stretch the thin sheet metal at a single impulse, even though very moderately and gradually performed. The hollow mould is placed on the flat table, shown in the view, and upon it is laid a blank of sheet metal, or a pile of blanks when several are to be stamped at once. The under side of the blank rests upon the flat upper surface of the hollow die, and the holder (shown with a round opening through it) is brought down upon the blank so firmly that, when the upper die descends, the metal has to expand into the hollow die, stretching out into a smooth seamless pan or kettle, without buckling or corrugating the margin. The upper or salient die is fastened to the headed screw (which is shown above), and is operated when the crosshead descends by means of the pitmen and cranks on the sides of the machine, forcing the blanks into the hollow die as far as the ductility of the metal will permit. The holder is clamped down upon the blanks by means of cams beneath the table. Metallic cartridge cases are made in the same way.

*Published by Messrs. Hurd & Houghton, New York city.

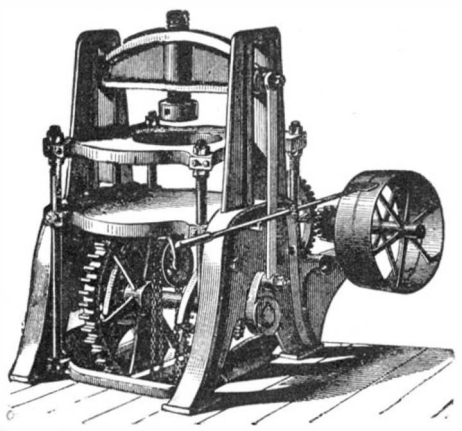

Fig. 4.—Howard's Stamping Press for Sheet Metal Ware.

Fig. 5 is a machine for shaping sheet metal. The plate to be shaped or stamped is placed upon the die, and the attendant depresses the treadle connected with the valve rod of the chest, *c*, whereupon, the water being admitted above the pistons of the four cylinders, the clamp, *b* is forced

Fig. 5.—Grimshaw's Machine for Shaping Sheet Metal.

downward, and fastens the circumferential portion of the plate between its own lower surface and the flat upper surface around the die. The other treadle is then depressed, and causes the central piston to descend and force the follower or stamp downward, so that the sheet metal is pressed

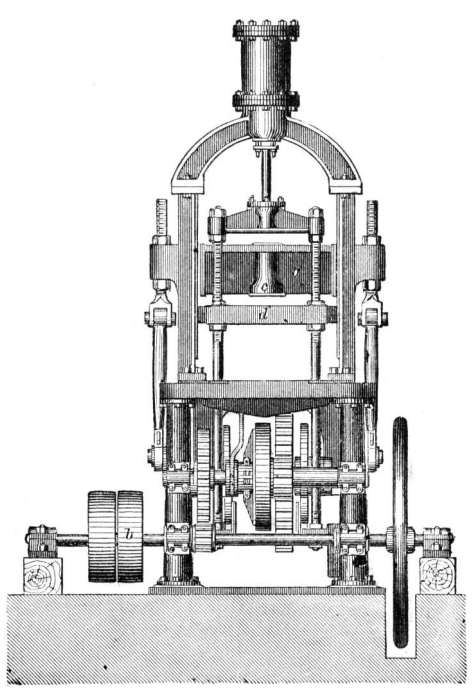

Fig. 6.—Stamping Press for Hollow Ware.

into the die and made to receive a corresponding form. As the sheet metal is thus forced into the die by the pressure of the follower or stamp, its circumferential portions are drawn out from under the clamp, and the strain or tension thus exerted upon the metal effectually insures smoothness in the completed article, and also enables a deeper dish or similar piece of ware to be produced at a single operation. *a* is a casting with four cylinders, and *e* the top plate on which the receiving chests are placed.

The press (Fig. 6) for stamping hollow articles of sheet metal has a crosshead, *a*, reciprocated by connecting rods from crank arms on a horizontal shaft rotated by gearing driven from the fast pulley, *b*. The crosshead receives a convex die, *c*, which works into a counterpart concave die held by the table, *d*, which is suspended by a yoke and rod from a piston in the cylinder above. The latter has a cushion of air in its lower part, so as to give a certain degree of elasticity to the blow, the table and lower die receding slightly before the pressure of the upper die.

The sheet metal drawing press, shown in Fig. 7, consists of an upright frame with vertically reciprocating crosshead, *a*, carrying a blank holder, *b*, containing a reciprocating plunger. The blank holder and plunger are independently operated by cams on shafts driven by a worm and wheel. By the action of the plunger the blank is forced into the die, *c*, which imparts the desired shape. The blank holder is adjustable to adapt the press for drawing different thicknesses of metal.

A sheet metal forming machine is shown in Fig. 8. The

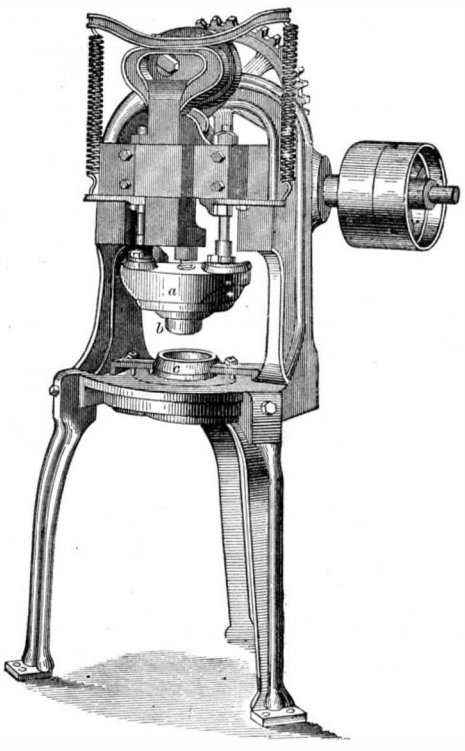

Fig. 7.—Sheet Metal Drawing Press.

upper die, H, is hinged to the lower die, E, and is lifted to place a sheet of metal in place for stamping, and then thrown over, and the arm, G, is secured by a catch. The central part, F, of the lower die has hinged side and end formers, *g*, which, when the two dies are drawn downward, descend between guides, C D, which throw up the formers,

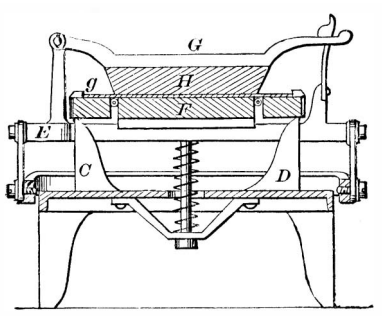

Fig. 8.—Sheet Metal Forming Machine.

g, and bend the metal to the required shape against the upper die, H. Square pans are thus produced.

American Institute Exhibition.

Application for space should be forwarded at once to the General Superintendent, room 22, Cooper Union building, New York, and all details arranged through him with as little delay as possible. Persons familiar with the exhibitions annually given by this Institute are aware that one of the great troubles with which the exhibitor has to contend is that of insufficient space; as all applications which comply with the rules are considered in the order of their coming, it is therefore evident that better location is secured by the early than by the late applicant. The Exhibition will open on the 11th day of September.

A Blondinian Mouse.

A correspondent gives an interesting account of a mouse that crossed from one building to another on a fire telegraph wire, over a distance of some four or five rods. Although the buildings were among the highest in Chicago, the feat was performed with perfect ease and grace. When near the observers he was frightened, when he carefully turned about and returned to the roof from which he came.

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RULES FOR ARTIFICIAL RESPIRATION IN THE TREATMENT OF THE DROWNED.

RULE I. (Fig. 1.)—*To Drain and Force Water from the Lungs and Stomach.*—Instantly place patient face downward, a hard roll of clothing being placed beneath the pit of the stomach, to raise it as much as possible above the level of the mouth. Put one wrist of the patient under his forehead to raise his mouth off the ground. With hands well spread upon the patient's back, above the roll of clothing, throw upon it your whole weight with a forward motion, and keep up the pressure about three seconds, so as to force all water from the stomach and lungs out of the mouth, ending the pressure with a push which will help to jerk you

FIG 1

back to your upright position. Repeat this once or twice, and then quickly proceed with—

RULE II. (Fig. 2.)—*To Make the Patient Breathe.*—Turn the patient face upward, the same hard roll of clothing being now beneath his back, the shoulders slightly drooping over it. Bend head backward and downward, putting throat on the stretch to the utmost. Place the hands of the patient on top of his head (one twist of a handkerchief or string around the crossed wrists will keep them there). Rip or strip all clothing from waist and neck. Now kneel astride the patient's hips. Grasp the front part of the chest on both sides of the pit of the stomach, your thumbs pointing to patient's chin, and your fingers fitting into the grooves between the short ribs. Fix your elbows firmly, making them one with your sides and hips, and then, firmly pressing the sides of the patient together, and using your knees as a pivot, throw yourself slowly forward for two or three seconds until your face almost touches the face of the patient, and your whole weight presses upon his chest. End this pressure with a short push which suddenly jerks you back again to the upright kneeling position.

Rest three seconds while the ribs spring back; then repeat this bellows-blowing movement as before, gradually increasing the rate from seven to ten times a minute; but take the utmost care, on the occurrence of a natural gasp, not to interrupt it; but, as the ribs fall, gently press them and deepen the gasp into a longer breath. Continue this until the natural breathing, which you are imitating, needs no further assistance. If all fails, keep on, because any moment within an hour's effort you may unexpectedly be rewarded with success.

Avoid impatient vertical pushes; the force must be upward and inward, increased gradually from zero to the maximum the age, sex, etc., may indicate.

If a second person be present and can do it, the tongue should be held out of one corner of the mouth by the thumb

FIG. 2

and finger, armed with a piece of dry cotton or linen rag (Fig. 2, *a*).

We take our illustrations from the London *Lancet*.

Plantain Leaves in Toothache.

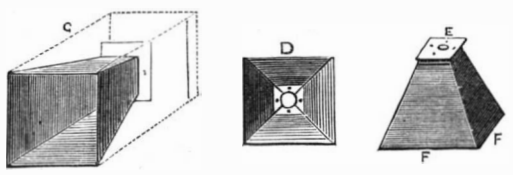
A homeopathic physician states that he has found in the large leaved plantain (*Plantago major*) a sure remedy for toothache. This plant, which is so common in every door yard as to prove a nuisance, was highly esteemed by the ancients, who employed it in hemorrhages (particularly from the lungs), consumption, dysentery, and other complaints. In modern times it has been sometimes used for similar purposes, but is now generally believed to possess very feeble properties. The leaves are saline, bitterish and austere to the taste; the root saline and sweetish.

For toothache our authority gathers the plant when the flowering spike has grown to full perfection. The leaves are chopped up finely, closely packed in a bottle, and covered with strong alcohol for a week. At the end of this time the bright green color of the tincture has changed to brown, and it is fit for use. In using it a piece of cotton wool is saturated with the tincture and inserted in the cavity of the tooth, and four drops of the same put in half a tumbler of water, and a teaspoonful taken for a dose. By rubbing the tincture on the gums, it was found to lessen the pain of infants in the process of teething; when inserted in the ear it is said to be equally efficacious in earache. As there are undoubtedly many plants of whose medicinal virtues we are perfectly ignorant, and as toothache is one of those torments which often baffle all attempts on the part of the physician to cure it, it may, remarks the *Medical Press and Circular*, be worth while to give this reputed remedy a further trial—a trial which need not be delayed in the case of such a common complaint as that of the toothache.

It will be observed that this tincture of plantain leaves is directed to be made with strong alcohol; from the known effects of liquors like brandy and whisky (which are no stronger than dilute alcohol) in relieving the pain of toothache, when held in the mouth for a short time, we are inclined to believe that this "tincture" of plantain would prove equally efficacious with the plantain leaves left out!

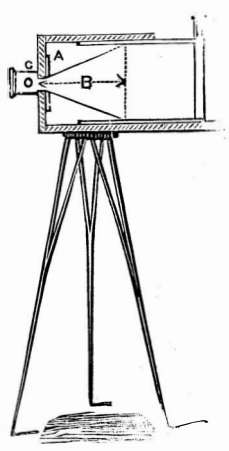
A CAMERA IMPROVEMENT.

I forward you a rough sketch of a contrivance I have adopted in all my cameras. It is a certain guard against fog from a bad sliding camera, and I find the pictures sharp-



er and better defined, as the light from the lens is carried evenly on the sensitive plate. There are no shadows from the corners of the camera, nor harbor for dust.

I make the funnel with quarter inch seasoned mahogany to fit inside the sliding body of the camera, and fasten to the front of the camera inside, by four screws. A B is the funnel, just the length of the camera when closed; C is the lens; D shows the funnel looking from the ground glass when focusing with the round hole the size of the lens; the dotted lines show the piece of wood (the funnel is fastened); the four black dots the screw holes to fasten to the end of the camera. E is the funnel (bottom up), showing the piece on the end to screw to the end of the camera; F F must be the exact size of the inside sliding part of the camera; G is the funnel ready to screw into the camera.—*W. Basham in the Photographic News.*



Antiseptic Properties of Borax.

According to the *Lancet*, at a recent meeting of the Academy of Sciences of Lombardy, G. Polli reported the results of numerous experiments in which beer, meat, eggs, blood, and urine were treated with boracic acid and borax for thirty days during the summer time, and were found still to retain their freshness, and to present no traces of fermentation having taken place in them. In experiments, on the other hand, without the addition of the salt, but in some cases with the addition of sulphate of soda, the fluids passed into a state of complete decomposition in the course of fifteen days. The energetic disinfecting power possessed by boracic acid and borax, and the facility with which these substances can be absorbed into the economy, led Polli to recommend their use in diseases in regard to the infectious nature of which no doubt exists, or in which septic conditions readily arise. He adduces several examples in which the febrile conditions of tuberculosis underwent diminution. No benefit was obtained by Professor Visconti from experiments made with these remedies in malaria, though other observers have arrived at a different conclusion. In chronic cystitis, the muco-purulent discharge quickly diminished, and even altogether disappeared in the course of a few days, and rapid improvement occurred in cases of bad suppurating wounds when they were applied externally. The dose recommended by Polli is 75 grains of boracic acid and 150 grains of borax per diem.

Improved Railway Speed.

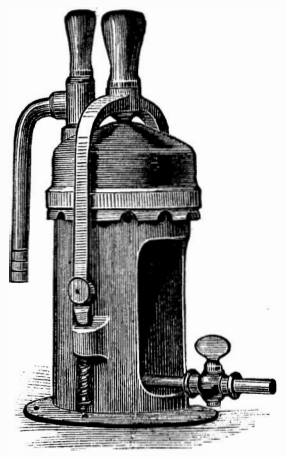
The regular time tables of the Central of New Jersey and the Pennsylvania Railway show that improvements of their roadbeds have been gradually completed, until now they daily send passenger trains through from Jersey City, opposite New York, to Philadelphia, distance 88 and 89 miles, in one hour an fifty minutes running time, including stops; being 48 miles per hour average speed. If the same speed could be maintained between New York and Washington, the time of transit would be four hours and thirty minutes. It seems to us that the public interests require that this should now be done.

SAFETY OXYGEN APPARATUS.

The chief features in this apparatus are portability, dispensing with the use of gas bags, pressure boards, weights, etc., for lime-light effects and perfect safety.

In the first place, the principle consists in generating oxygen in small quantities at the time of consumption (whereby a continuous supply is maintained) from charges of chlorate of potash and oxide of manganese made into solid cakes of about three inches diameter and five eighths of an inch thick. which are quite easy to produce, clean to handle, and about as hard as a piece of coal. The principle of the retort or generator will be clearly seen from the accompanying engraving, Fig. 1. It consists of two pieces, a flat plate and a bell-shaped cap, supported by a stand, in which is fixed a Bunsen burner of improved construction. The cap has an aperture at the top, in which is screwed a pipe, etc., for conveying away the oxygen when made. In other respects the retort proper consists of two simple iron castings turned and ground to a gas-tight fit.

Fig. 1.

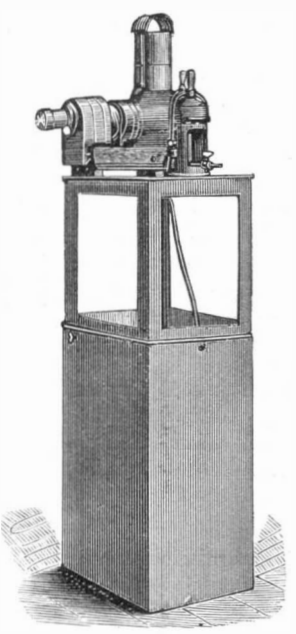


The fastening consists of a bow, clearly shown in the engraving, at the extremities of which are small spiral springs, so adjusted as to maintain a pressure equal to one and a half pound per square inch, which pressure is far in excess of what is necessary for ordinary lime-light arrangements.

Now it is obvious that, should the passage from the retort be closed (although in this apparatus there is little likelihood of such an occurrence), the pressure in the retort would rise until it had arrived at one and a half pound per square inch, when the gas would escape; and as soon as the passage was clear again the gas would take its right course, relieving the pressure inside the retort, and in virtue of the springs the top would close, resuming its original position. When exhibiting the apparatus at several scientific societies to illustrate its safety qualities, as the gas was coming off rapidly, the outlet pipe was closed (by a tap purposely introduced), and the oxygen, still being generated, escaped through the joint, as intended, with perfect safety. To open the retort for recharging, etc., pull over the wood handle fixed to the top of the bow, and the cap may then be removed by the wood handle fixed thereto; and to close the apparatus reverse these operations. The handles being made of wood prevent the possibility of burning the fingers when in use.

The method of making the cake is as follows: To four parts of chlorate of potash and one part of manganese add sufficient water to moisten, not to wet; after mixing well, fill the mould, using little pressure, smooth off the surplus with the assistance of a dinner knife or spatula, turn over, and the cakes will leave the mould entire. After sufficient cakes are thus made, they are set to dry, either by gentle heat or spontaneously; when dry, the bottoms are coated by dipping into a mixture of manganese and water, about the consistency of cream, when they are ready for use. This coating of the bottom with plain manganese is to prevent the spent cake sticking to the retort, being the only part in contact with it.

Fig. 2.



The gas holder is very similar (but with a little modification) to one invented and introduced by Mr. Samuel Highley, in 1862.

By a displacement chamber introduced in the outside casing, the water for luting is reduced to a minimum, about one ordinary bucketful being sufficient.

The displacement chamber, which is always dry, is used for packing apparatus, such as lanterns, slides, screen, etc., and is of sufficient capacity to hold all required for a magic lantern exhibition. The chamber is provided with a lid and suitable lock-up attachments. When in use, the pressure is applied by placing water in a reservoir provided for that purpose, maintaining one uniform pressure throughout, and can be regulated from a small to a great pressure, according to the quantity of water used. If more convenient, any other substance than water can be used for weighting.

Fig. 2 shows the apparatus used as a stand for the lanterns, in the present case a sciopticon, admirably arranged for the lime light, being adapted.—*W. J. Chadwick in English Mechanic.*

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ASTRONOMICAL NOTES.

BY BERLIN H. WRIGHT.

PENN YAN, N. Y., Saturday, August 3, 1878.

The following calculations are adapted to the latitude of New York city, and are expressed in true or clock time, being for the date given in the caption when not otherwise stated.

PLANETS.

	H.M.		H.M.
Mercury sets	8 15 eve.	Saturn rises	9 27 eve.
Venus rises	2 32 mo.	Saturn in meridian	3 26 mo.
Jupiter in meridian	11 23 eve.	Neptune rises	10 54 eve.

FIRST MAGNITUDE STARS.

	H.M.		H.M.
Alpheratz rises	7 21 eve.	Regulus sets	7 56 eve.
Algol (var.) rises	9 01 eve.	Spica in meridian	4 30 eve.
7 stars (Pleiades) rise	11 21 eve.	Arcturus in meridian	5 21 eve.
Aldebaran rises	0 44 mo.	Antares in meridian	7 32 eve.
Capella rises	10 08 eve.	Vega in meridian	9 43 eve.
Rigel rises	2 51 mo.	Altair in meridian	10 55 eve.
Betelgeuse rises	2 35 mo.	Deneb in meridian	11 47 eve.
Procyon rises	4 26 mo.	Fomalhaut rises	10 01 eve.

REMARKS.

Mercury, though near greatest eastern elongation, cannot be seen, as he sets only 1h. 2m. after the sun, and 47m. before the ending of twilight. Venus, with Procyon and Betelgeuse, nearly forms an equilateral triangle, Venus being the most northern, and a line from Capella to Procyon will pass through her, as will also a line drawn from Rigel to Betelgeuse and produced about 21°. Mars will soon be in conjunction with the sun, and is now too near the sun to be seen. Jupiter is upon the boundary line between the constellations Sagittarius and Capricornus, and is retrograding. Algol will be at minimum August 7, 4h. 29m. A.M. There will be a partial eclipse of the moon August 12, of which we will give the particulars and illustrations next week.

Astronomical Notes.

OBSERVATORY OF VASSAR COLLEGE.

The computations in the following notes are by students of Vassar College. Although merely approximate, they are sufficiently accurate to enable the observer to find the planets.

M. M.

Positions of Planets for August, 1878.

Mercury.

On August 1 Mercury rises at 7h. 5m. A.M., and sets at 8h. 19m. P.M. On August 31 Mercury rises at 7h. 3m. A.M., and sets at 6h. 49m. P.M.

Mercury is in its best position about the middle of the month, and should be looked for after sunset almost exactly in the west.

Venus.

Venus is far off and small, but very brilliant and beautiful in the early morning hours.

On August 1 Venus rises at 2h. 26m. A.M., and sets at 5h. 18m. P.M. On August 31 Venus rises at 3h. 22m. A.M., and sets at 5h. 31m. P.M.

Mars.

Mars passes the meridian between 1h. 10m. P.M. and noon all through the month, and cannot be well seen.

On August 1 Mars rises at 6h. 17m. A.M., and sets at 8h. 2m. P.M. On the 31st, Mars rises at 5h. 58m. A.M., and sets at 6h. 50m. P.M.

Jupiter.

On August 1 Jupiter rises at 6h. 50m. P.M., and sets at 4h. 14m. A.M. of the next day. On August 31 Jupiter rises at 4h. 42m. P.M., and sets at 2 A.M. of the next day.

A small telescope will show the four moons of Jupiter, but they are sometimes invisible from their position relatively to the planet. If we take the hour between 9 and 10 P.M. as that of our observation, we shall not see the 1st satellite, or that nearest to Jupiter, on August 1, 8, and 31, that satellite being in transit across the face of Jupiter.

The same satellite is invisible at the same hour on August 16 and 23, because it is behind the planet or is occulted by Jupiter.

Taking the same hour of the evening, Jupiter is seen without the 2d or smallest satellite on August 3 and 10, because the satellite is in transit, and on the 26th because the satellite is behind the planet.

On August 23 the 3d or largest satellite is in transit when Jupiter is first seen, and it does not pass off the planet until near 11 P.M., and as the 1st satellite is hidden behind Jupiter, the planet is seen between 9 and 10 P.M. with only two moons.

On August 15 the planet is seen without its 4th or most distant satellite, as that moon is behind Jupiter early in the evening. The satellite comes out from behind Jupiter after 11 in the evening, and is seen for a few minutes, when it disappears by going into the shadow of Jupiter, and is eclipsed.

Saturn.

In August Saturn becomes conspicuous to evening observers. This planet rises on the 1st at 9h. 34m. P.M., and sets at 9h. 26m. A.M. of the next day. On August 31 Saturn rises at 7h. 33m. P.M., and sets at 7h. 20m. A.M. of the next day.

Uranus.

Uranus keeps very nearly the diurnal course of the sun, and of course is very unfavorably situated for observation.

On August 1 Uranus rises at 6h. 37m. A.M., and sets at 8h. 9m. P.M. On August 31 Uranus rises at 4h. 48m. A.M., and sets at 6h. 15m. P.M.

Neptune.

Neptune can be seen only by means of a very good glass. It rises on the 1st at 11 P.M., and on the 31st at about 9h. P.M.

Natural History Notes.

Variations in Birds' Nests.—The *Science Gossip* says: This year we have noticed three curious instances of a departure from the usual habits of birds in building their nests, which seem worth recording. The song thrush lines her nest with cow dung and clay; and it is usually considered by ornithologists that, as she builds very early in the spring and frequently in exposed situations, the mud lining protects the eggs and the young brood from the fierce March winds. Early in March we found a thrush's nest in our garden, containing four eggs; but the nest had not a vestige of the usual mud lining. Unfortunately we found the nest destroyed one morning before the bird had time to hatch, so it was impossible to note whether the inclement weather had any effect on the eggs. We have at this moment a blackbird sitting upon six eggs, four of which are her own and the other two those of the song thrush. When first the nest was found it contained two of each kind, a thrush having laid in the blackbird's nest. Although sparrows will sometimes appropriate swallows' nests to build in, and though several birds will build a new nest on an old foundation, it is, I think, very unusual for one species—the cuckoo, of course, excepted—to make use of a nest built by another species. The third curiosity of nest building is the nest of a chaffinch, placed in the fork of an elder bush near our house. Usually the chaffinch assimilates the color of her nest to the situation in which she places it; if she builds in a hedge she generally covers it with green moss; but if she builds, as she often does, on the bare branch of an old apple tree, she uses the gray lichens, which are usually near at hand, and covers her nest with them so skillfully that though quite open and exposed it becomes hidden by its resemblance to a knob or excrescence of the tree itself. In this case, however, though the bird has recognized the necessity of covering her nest with something, she has rendered it most conspicuous by sticking little bits of white decayed wood all over it. The wood is so white that the nest looks almost like a snowball in the branches. Possibly this bird may be color blind, or she may be just a little bit "wanting" in her instinctive faculties, as human beings are occasionally in their reasoning powers. Why not?

Distribution of Spiders by Winds.—The Rev. H. C. McCook states that a large laterigrade spider (*Sarotes venatorius*), of the ballooning kind, occurs, according to specimens in his collection, from Santa Cruz, Virgin Isles, to Cuba, Florida and Yucatan, Central America, Mexico and California, Sandwich Islands, Loochoo Islands and Japan, and thence across Asia and Africa to Liberia, and suggests, in view of these facts and other localities on record, that the trade winds have promoted this distribution. Among the other localities are the Society Islands, Feejees, Friendly Islands, New Caledonia, Eastern Australia, Mauritius, Madagascar, and several parts of South America. He refers to a fact stated by Darwin, that at a distance of sixty miles from land, while the Beagle was sailing before a steady light breeze, the rigging was covered with vast numbers of small spiders with their webs; each, when first coming in contact with the rigging, seated upon a single filament of spider web, and so slenderly in some cases that a single breath of air was found to bear them out of sight. Mr. McCook states that the specimens examined by him show no variations which may not be accounted for by differences in age, or which may not come within those ordinary natural differences which all animals more or less exhibit.

Variations in Bulbs of Lilies.—Mr. H. J. Elwes, F.L.S., in his magnificent monograph on the lily genus, notices as a curious fact "that all the American lilies, though varying remarkably among themselves, differ entirely in their bulb structure from those of Europe and Asia, and the same peculiarity is noticeable among the American species of *Fritillaria* (crown imperials), which, as far as we know them, have bulbs of small white and granular scales, loosely attached to a solid central axis from which the stem springs. Of all the Old World lilies and fritillaries, only two (*Lilium arenaceum* and *Fritillaria kamschatkensis*) resemble their American congeners in the formation of their bulbs, and both of these are restricted in their geographical limits to the shores of north-eastern Asia, which have many affinities, both botanical and zoölogical, with the Pacific coast of North America."

Depth to which Roots Penetrate.—Mr. Foote, in Massachusetts, has traced the tap root of a common red clover plant downward to the perpendicular depth of nearly five feet. The Hon. J. Stanton Gould followed out the roots of Indian corn to the depth of seven feet, and states that onions sometimes extend their roots downward to the depth of three feet; lucerne, fifteen feet. Hon. Geo. Geddes sent to the Museum of the New York State Society a clover plant that had a root four feet two inches in length. Louis Walkhoff traced the roots of a beet plant downward four feet, where they entered a drain pipe. Professor Schubart found the roots of rye, beans, and garden peas to extend about four feet downward; of winter wheat, seven feet in a light subsoil, and forty-seven days after planting. The roots of clover one year old were three and a half feet long; those of two year old plants, four inches longer.

The Coloring Matter of Birds' Eggs.—The brilliant and remarkably permanent color of the eggs of many birds has led Liebermann to investigate its cause. He finds that however widely different these colors are from each other, they are due essentially to but two coloring matters, one a blue or green substance, probably a biliary coloring matter, the other characterized by a remarkable absorption spectrum. These coloring matters are contained in the superficial layer of the shell, often in several thicknesses. When the shell is treated with hydrochloric acid the coloring separates in flocks, and by treatment with alcohol a strong solution may be obtained. With the eggs of gulls and plovers an unsuccessful attempt was made to obtain the coloring matter pure.

The Seed Crop of Some Weeds.—Professor Prentiss, of Cornell University, has estimated the annual crop of seed produced by single plants of some of our common weeds. He finds that the dandelion produces 2,000; the ox-eye daisy, 13,000; dock, 13,000; burdock, 24,000; mayweed, 40,000; red poppy, 50,000.

Some time ago, according to the *Journal of Pharmacy*, Mr. Theo. G. Davis chose a plant of thorn apple (*Datura*) with the intention of collecting its leaves and seeds. The plant, however, was destroyed by a storm in September, at which time it had produced 125 flowers and capsules; and as each capsule contained between 700 and 735 seeds, the total yield of the plant was over 90,000 seeds.

Upon reading such figures the only wonder is that weeds can be kept down at all. The fact is, however, that great numbers of the seed fail to plant themselves, and many remain in the ground several years, only to spring up as weeds when the ground is stirred. In evidence of the latter fact Professor Prentiss refers to a tobacco field where the seed had been allowed one year to ripen and fall. For ten years afterward tobacco plants appeared in that field from this seedling.

An Electric Manometer.

La Chronique Industrielle describes a new manometer of a sensitiveness which is said to be almost absolute. This instrument is the result of a combination of two apparatus already known—Bell's telephone and the batoreometer of Professor Giordano of Naples.

The latter instrument is designed for measuring thicknesses, or the minutest variations of thickness. Thus, after having measured the thickness of a pane of glass at an ordinary temperature, the batoreometer will show the increase of thickness which results from expansion due to the warmth of the hand which holds the pane.

A vertical tripod is traversed by a very fine micrometer screw, and surmounted by a dial, the border of which is marked off into divisions according to a certain scale.

The object is laid upon the table, and the micrometer screw caused to approach it. As soon as contact takes place an electric current, shown by a galvanometer, passes between the point of the screw and the table. If the object to be measured is a poor conductor, it is coated with gold-leaf.

Let us now suppose that a current of air, whose intensity we wish to measure, is exercising a pressure on the flexible membrane of a Bell's telephone; the membrane will bend under the influence of an extremely small quantity, but this quantity can never be so minute as to be inappreciable by the electric current of a batoreometer.

The new instrument is extremely sensitive to movements of the air, and detects and records even the waves produced by ordinary noises. It is both a manometer and anemometer of great accuracy.

Color Blindness.

Prosecuting their researches on color blindness, Professors Cohn and Magnus, of Breslau, have recently examined more than 5,000 children. Of 2,761 boys there were 76 who suffered from this blindness, or 2·7 per cent. Of 2,318 young girls, there was only 1 incapable of distinguishing colors. Further, a curious fact was established. Among 1,947 Christian boys, 42 were unable to make this distinction, or 2·1 per cent; among 814 Jewish boys, 34, or 4·1 per cent; and among 836 Jewish girls, not one. These results seem to prove that in the case of girls color blindness hardly exists at all, and that among Jewish boys it is about twice as common as among Christian boys (though local influences might possibly affect the results). In this connection we note that M. Favre has lately been studying Daltonism in France, and he finds there are in that country more than 3,000,000 persons thus affected. The number of females affected is to that of males as 1 : 10. He says that nine cases of Daltonism out of ten may be easily cured in young subjects, the best mode of treatment being methodical exercise upon colored objects. Mothers should be careful to develop the chromatic sense in their children. Examinations and exercises in colors should be conducted in all schools, etc.

A New Stimulant.

The *British Medical Journal* gives a long account of a new stimulant, which has lately been described by the papers of Australia. It is called pitcherine by the natives, and is used by them as we use tobacco, both for smoking and chewing. Its effect is that of a pleasant exhilaration; when long continued, intense and continuous excitement follows. It is used, when on long foot journeys, to invigorate and keep up the strength or excite them to courage in battle; large doses are said to infuriate all the passions. Some of the natives make a plaster of the plant and place it back of the ears, believing they are influenced by it.

A WRITER in the London *Times*, remarking upon the slipping of horses on the London pavements, recommends that horses go unshod, and says that for twenty-five years he has employed many (often 200 at a time) on all kinds of roads and in all kinds of work, without having one of them shod and without injury to their feet, being careful only not to put a newly unshod horse at once upon a bad road. Has there been any such experience here? Why do we shoe our horses?

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Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

Portable and Stationary Engines; Boilers of all kinds; 45 Cortlandt St., N. Y. Erie City Iron Works, Erie, Pa.

Lubricene.—A Lubricating Material in the form of a Grease. One pound equal to two gallons of sperm oil. R. J. Chard, New York.

Situation Wanted by a Machinist and Engineer, experienced as foreman. Address Draughtsman, 547 Lafayette Ave., Brooklyn, N. Y.

Best Turbine Water Wheel, Alcott's, Mt. Holly, N. J.

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Sperm Oil, Pure. Wm. F. Nye, New Bedford, Mass.

Power & Foot Presses, Ferracute Co., Bridgeton, N. J.

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Kreider, Campbell & Co., 1030 Germantown Ave., Phila., Pa., contractors for mills for all kinds of grinding.

Diamond Planers. J. Dickinson, 64 Nassau St., N. Y.

Boilers & Engines cheap. Lovegrove & Co., Phila., Pa.

Punching Presses, Drop Hammers, and Dies for working Metals, etc. The Stiles & Parker Press Co., Middletown, Conn.

Wanted—A Combined Power Punch and Shears for light work. 209 West 33d street, N. Y.

Do your own Nickel and Silver Plating. Outfits, with Batteries and Solutions complete, $5 and upwards. Union Silver Plating Co., Princeton, Ill.

Wanted—Articles to Manufacture in the Hardware or Machinery line, on royalty or by contract. D. J. Miller, Mohawk, N. Y.

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Extra Fine Taps and Dies for Jewelers, Dentists, and Machinists; in cases. Pratt & Whitney Co., Manufacturers, Hartford, Ct.

If Mr. T. R. S., of Query No. 12, page 410, date June 29, will send his name and address to Wm. S. Dean, Box 600, Hornellsville, N. Y., he can learn something very much to his advantage.

"The Best Mill in the World," for White Lead, Dry, Paste, or Mixed Paint, Printing Ink, Chocolate, Paris White, Shoe Blacking, etc., Flour, Meal, Feed, Drugs, Cork, etc. Charles Ross, Jr., Williamsburgh, N. Y.

Warranted best and cheapest Planers, Jointers, Universal Woodworkers, Band and Scroll Saws, etc., manufactured by Bentel, Margedant & Co., Hamilton, Ohio.

Patent Wood-working Machinery, Band Saws, Scroll Saws, Friezers, etc. Cordesman, Egan & Co., Cincin'ti, O.

The only genuine Geiser Self-regulating Grain Separator. Address the Geiser Manuf. Co., Waynesboro' Franklin Co., Pa.

Manufacturers of Improved Goods who desire to build up a lucrative foreign trade, will do well to insert a well displayed advertisement in the SCIENTIFIC AMERICAN Export Edition. This paper has a very large foreign circulation.

Safety Linen Hose and Rubber Hose, all sizes, at reduced rates. Greene, Tweed & Co., 18 Park Place, N. Y.

Hydraulic Presses and Jacks, new and second hand. Lathes and Machinery for Polishing and Buffing metals. E. Lyon & Co., 470 Grand St., N. Y.

Alcott's Turbine received the Centennial Medal.

Nickel Plating.—A white deposit guaranteed by using our material. Condit, Hanson & Van Winkle, Newark, N.J.

Cheap but Good. The "Roberts Engine," see cut in this paper, June 1st, 1878. Alse horizontal and vertical engines and boilers. E. E. Roberts, 107 Liberty St., N. Y.

The Cameron Steam Pump mounted in Phosphor Bronze is an indestructible machine. See ad. back page.

Empire Gum Core Packing, Soap Stone Packing, in quantities to suit. Greene, Tweed & Co., 18 Park Place, N. Y.

Presses, Dies, and Tools for working Sheet Metals, etc. Fruit and other Can Tools. Bliss & Williams, Brooklyn, N. Y., and Paris Exposition, 1878.

The SCIENTIFIC AMERICAN Export Edition is published monthly, about the 15th of each month. Every number comprises most of the plates of the four preceding weekly numbers of the SCIENTIFIC AMERICAN, with other appropriate contents, business announcements, etc. It forms a large and splendid periodical of nearly one hundred quarto pages, each number illustrated with about one hundred engravings. It is a complete record of American progress in the arts.

Diamond Self-clamp Paper Cutter and Bookbinders' Machinery. Howard Iron Works, Buffalo, N. Y.

For Sale—One Large Circular Saw Mill; will saw logs 75 feet long. Very Heavy Iron Frame. Sell Cheap. E. P. Bullard, 14 Dey street, New York.

Bound Volumes of the Scientific American.—I will sell bound volumes 4, 10, 11, 12, 13, 16, 28, and 32, New Series, for $1 each, to be sent by express. Address John Edwards, P. O. Box 773, New York.

For Power & Economy, Alcott's Turbine, Mt. Holly, N.J.

Dildine's Self-setting Catchaline Traps. Best out for Catching Mice, Rats, Rabbits, etc. Sample Trap by Mail, $1. Agents Wanted. John Dildine, Milton, Pa.

Wanted—A Steam Road Locomotive. Manufacturers send circulars to Derastus Spencer, Jr., Corinne, Utah.

Improved Wood-working Machinery made by Walker Bros., 73 and 75 Laurel St., Philadelphia, Pa.

For Solid Wrought Iron Beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

For Heavy Punches, Shears, Boiler Shop Rolls, Radial Drills, etc., send to Hilles & Jones, Wilmington, Del.

Dead Pulleys, that stop the running of Loose Pulleys and Belts, taking the strain from Line Shaft when Machine is not in use. Taper Sleeve Pulley Works, Erie, Pa.

Pulverizing Mills for all hard substance and grinding purposes. Walker Bros. & Co., 23d and Wood St., Phila.

2d hand Planers, 7′ x 30″, $300; 6′ x 24″, $225; 5′ x 24″, $200; sc. cutt. b'k g'd Lathe, 9′ x 28″, $200; A. C. Stebbins, Worcester, Mass.

J. C. Hoadley, Consulting Engineer and Mechanical and Scientific Expert, Lawrence, Mass.

Solid Emery Vulcanite Wheels—The Solid Original Emery Wheel—other kinds imitations and inferior. Caution.—Our name is stamped in full on all our best Standard Belting Packing and Hose. Buy that only. The best is the cheapest. New York Belting and Packing Company, 37 and 38 Park Row, N. Y.

NEW BOOKS AND PUBLICATIONS.

THE RAILWAY BUILDER. A handbook for estimating the probable cost of American railway construction and equipment. By William J. Nicolls, C.E. Henry C. Baird & Co., Publishers, 810 Walnut st., Philadelphia. Price, postpaid, $2.

A handy little work in pocket book form, containing information of a practical character derived from the author's experience and from various standard authorities. Clearly and concisely written, well illustrated, and in general a useful guide to the railway engineer.

Notes & Queries

(1) D. writes: In these times of base ball matches, will you please give your readers the rationale of the "curved ball," about which we hear so much? A. See SCIENTIFIC AMERICAN, No. 20, vol. 37, November 17, 1877.

(2) W. Y. asks: If I were to take two amalgamated zinc plates, each 6 inches square, and two copper plates, each 6 inches square, and place each pair in a separate earthen vessel containing diluted sulphuric acid, and connect the zinc of one pair with the copper of the other, would the battery thus made be strong enough to plate metals and make electrotypes? A. Yes.

(3) M. H. W. wishes to know if there is anything to keep animal liquid from stinking. A. Carbolic or salicylic acid.

(4) W. F. asks: Can you tell me what will dissolve zinc without evolution of gas? A. You may try a strong aqueous solution of ferric chloride or solution of potassium bichromate or permanganate mixed with strong solution of ammonium chloride (preferably hot) acidified with a few drops of nitric acid. Cupric chloride solution deposits copper in place of a portion of the zinc dissolved. Also by making the zinc plate (first superficially amalgamated with mercury) the anode of a couple in dilute sulphuric acid or strong aqueous solution of ammonium chloride, using a moderately active electric current from a separate battery, or by exposing the plate (in either of the liquids mentioned) as one of the positive plates of such a battery.

(5) S. E. asks: Can a fresh egg be preserved by coating it with any substance which will exclude the air? A. Yes, for a time. Gum arabic, shellac, and paraffin are used. The Germans apply linseed oil. See SCIENTIFIC AMERICAN, p. 75 (24), vol. 37, and SUPPLEMENT No. 65, p. 1030.

(6) O. W. S. asks: 1. What are the properties of the metal aluminum? Is it a rigid or stiff metal? Will it resist strain tending to bend it? A. Yes. It has, when pure, about the hardness of silver and tensile strength of copper. 2. Is it brittle? A. It is not brittle. 3. Will it run freely when melted? A. It melts at about 1,300° Fah., rather slowly when pure, but flows easily and may be cast. 4. Is it solid, not porous, when cast? A. See pp. 798, 1213, 1337, and 1635, SCIENTIFIC AMERICAN SUPPLEMENT.

(7) C. T. R. asks: Is the carbon in the carbon telephone graphite, or some other form of carbon? A. It is lampblack collected from burning kerosene or other light hydrocarbon. It is compressed into a button under great pressure.

(8) J. H. asks (1) for a recipe for making birdlime. A. Boil the middle bark of the holly 7 or 8 hours in water, drain it, and lay it in heaps in the ground, covered with stones, for 2 or 3 weeks, till reduced to a mucilage. Beat this in a mortar, wash it in rain water, and knead it till free from extraneous matters. Put it into earthen pots, and in 4 or 5 days it will be fit for use. An inferior kind is made by boiling linseed oil for some hours until it becomes a viscid paste. 2. Give length of time it will remain fit for use when exposed to heat of sun. A. We do not know.

(9) R. C. B. asks for a recipe for exterminating red ants. A. Dissolve some camphor in a small quantity of methylic alcohol, precipitate it by addition of water, and project a little of the suspended camphor into their haunts. A very small quantity of carbolic acid used in a similar manner will answer as well or better—especially if the solution contains glycerin. Tobacco water and powdered borax are also said to be effectual.

(10) W. D. H. writes: I unfortunately spilt a solution of iodine (in alcohol) over the page of a valuable book. The paper composing the book is not glazed, but rather coarse. How am I to remove the iodine without injury to the book? A. Apply solution of pure sodium hyposulphite, and then strong ammonia water, by means of blotting paper; remove excess by pressing between sheets of bibulous paper moistened with water, and dry between clean warm (dry) blotting pads.

(11) D. F. writes: In drying white shirts in the drying room of a laundry we use the waste heat from the furnaces on which the ironers heat their smoothing irons, the furnaces being located on the floor below the dry room, and the hot air passes constantly from the furnaces through heat flues to the floor above. But there go up with the hot air minute particles of dust and ashes which oil the shirts. Can you suggest any way to overcome this difficulty? A. Place on your furnaces heating drums having a great number of air flues which are in communication with the external air and also with the drying room. Allow the products of combustion to pass around the air flues.

(12) S. R. S. asks: How long does it take benzine to be saturated with fat, and must it be heated to become so? Must it be distilled to be separated from the fat, or must the mixture be pressed? I have tried distillation, which resulted in the cork being expelled from the bottle, and as I had the bottle in a water bath no harm resulted. I am anxious to make the experiment, yet have no desire to risk an explosion with such a dangerous substance as benzine. A. Heat your heavy oil over a water or sand bath for some time, and you will doubtless recover the fatty matters. We would not advise you to risk the "distillation" of benzine in a corked bottle. For information respecting the construction of apparatus for distilling, etc., consult any elementary work on chemistry. Your druggist will perhaps loan you books. A strong solution of the dry fatty matters in benzine may be made at ordinary temperatures in ten minutes, if properly agitated together.

(13) J. H. M. asks: What kind of oil is used to thin printer's ink, so as to work on the stencils made by the electric pen? A. A little nut oil or a "varnish" prepared by igniting the boiling oil, and allowing it to blaze, while constantly stirred for a short time.

(14) H. S. T. asks: 1. Are anodes now made of pure nickel? A. The nickel plates sold as pure nickel contain small quantities of carbon, presumably as carbide of the metal. 2. In forming sulphate of nickel, will it do to use metal instead of oxide of nickel? A. Yes, but not very well; it would require the application of heat; the oxide is much cheaper. 3. How is an oxide of nickel formed? A. There are two oxides of nickel. The monoxide (NiO) is prepared by heating the nitrate to redness or by precipitating a soluble nickel salt with caustic alkali, and washing, drying, and igniting the apple green hydrated oxide. The sesquioxide (Ni_2O_3) is prepared by passing chlorine through water holding the hydrated monoxide in suspension. It is also produced by mixing a soluble salt of nickel with solution of bleaching powder (calcium hypochlorite). The former oxide is of most importance.

(15) D. R. writes: Will you please tell me of any compound that could be moulded to make an imitation of rubber (hard) or coral? A. Vulcanized fiber or celluloid has been used successfully. See p. 10, vol. 38, and pp. 147 and 204 (73), vol. 37, SCIENTIFIC AMERICAN.

(16) J. W. McM.—Telescopic specula are parabolic and not elliptical. We do not know that disks of speculum metal are in market. The constituents of speculum metal are copper 66·6 parts, tin 33·4 parts. For optical works, write to an industrial publisher.

(17) C. W. writes: Will you inform me as to the proportions of bisulphuret of carbon and chloride of sulphur used in vulcanizing rubber, by what is known as the cold process, and the manner of applying and time required? A. The caoutchouc is simply immersed for a short time in a mixture of 40 parts of carbon disulphide and one of sulphur chloride; then transferred to a room heated to 70° Fah. until the sulphide has evaporated, when it is boiled in a solution of 1 lb. of caustic soda and 2 gallons of water, and then thoroughly washed. Benzolene, the lighter product of the distillation of petroleum, has been used in place of carbon sulphide.

(18) C. H. M. writes: 1. We are taught in our works on physics that when an electrical current passes through a direct or right hand helix, which incloses a magnet, if the current flows from right to left it determines the poles of the magnet in a fixed direction relative to the flow of the current. If the current be reversed the poles will also be reversed. If a permanent magnet be surrounded by an insulated wire, and a current of electricity be passed through the wire in a direction contrary to the harmony of magnetic polarity and electrical currents, the effect is first to demagnetize the bar and then reverse its poles by remagnetizing it by induction, in a contrary direction to that which it possessed before the current began to flow. How can these facts be reconciled with the use of permanent magnets in the Bell telephone? A. The current induced in the helices is so slight that it is doubtful if this alone would affect the power of the magnet. The Bell telephone as now constructed has a soft iron core projecting from the end of a compound bar magnet for receiving the helix. This core serves as an armature to the magnet, and as a preventive of demagnetization. 2. How is gas carbon prepared to mould into different shapes, or made into pencils or sticks for use in galvanic batteries? A. They are made by calcining in an iron mould an intimate mixture of coke and bituminous coal, finely powdered and strongly compressed.

(19) E. M. B. asks for the name of any work in which he can find "spontaneous combustion" specifically treated. A. See article on the subject by Joseph Williams, SCIENTIFIC AMERICAN SUPPLEMENT, No. 32.

(20) W. A. writes: I am running 18 inch saws, and do what I will the boxes will heat. Until recently I ran them at a speed of 2,400 revolutions per minute. I slowed them down to 2,050, and still they seem to heat just as bad. I was using a poor class of Babbitt and thought that was it. I bought some of the best I could buy, and still they heat. A. Either your boxes are out of line or the mandrel is sprung or out of round, or the boxes are too short. We would recommend truing the mandrel in a lathe, and the use of longer boxes, which must be rigidly mounted.

(21) F. S. asks: Can you tell me how the liquid bronze is made that is sold in shoe stores for bronzing shoes? A. It is made by dissolving aniline red in thin alcoholic shellac varnish. Add the aniline until you get the bronze effect.

(22) C. B. T. writes: Can you say anything about potato flour in your "Notes and Queries"? A. The potato flour used by confectioners and Hebrews is simply fine potato starch reduced to flour in a mill similar to that used for flouring wheat.

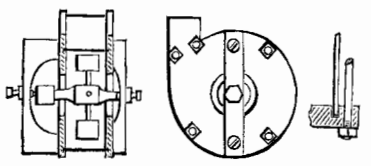
(23) "Nails" asks how to copper iron articles, such as nails, etc. A. Clean the iron by pickling it in dilute oil of vitriol and tumbling in a barrel, with sand if necessary; then bring them into contact with a strong aqueous solution of copper sulphate.

(24) A. M. H. asks: Do you know any good recipe for making fly paper that fastens them to the paper? Boiled linseed oil and sugar are the materials used, we believe.

(25) Y. O. asks: What kinds of paper and what process are used to manufacture changeable paper flowers, which change their color according to the atmosphere? A. Saturate the paper with a moderately concentrated solution of cobalt chloride in rain water.

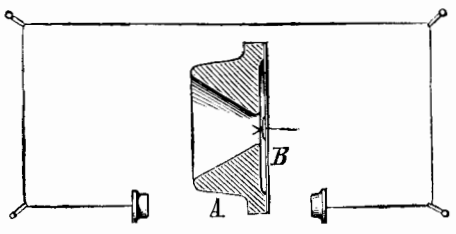
(26) M. A. D. writes: I am troubled with superfluous hair and I want to get rid of it. How can I do it? A. Böttger recommends the following: 1 part, by weight, pure crystallized sodium sulphydrate, and 3 parts of fine purified chalk; rub well together, moisten with water, and apply a layer the thickness of a knife blade. It should be allowed to remain in contact with the flesh not more than two or three minutes to avoid injury to the skin. Depilatories of this kind destroy the vitality of the hair. We do not recommend their use. If the materials are impure the skin may be stained.

(27) C. M. B. asks: How can I construct a small pressure blower, suitable for a sand blast? A. Make two wooden side pieces of the form shown in the side elevation. Cut a groove in each to receive the sheet iron strip which forms the curved sides. Turn a wooden shaft. Insert metal bearing pieces in its ends. Bore four holes in the hub and insert four arms with fans attached. Support the shaft on pointed screws inserted in the cross pieces attached to the side pieces. Clamp the side pieces to the edges of the sheet iron by means of small bolts. We give dimensions below:- Di-



ameter of case, 6 inches; thickness of case inside, 2½ inches; size of opening in sides, 2⅜ inches; size of fans, 1½ x 2 inches; discharge opening, 1½ x 2½. The size and proportions may be varied. A fan of this sort will answer for the sand blast or for a small forge, but if it is to be used continuously the shaft should be iron or steel and it should be run in well made boxes.

(28) P.B., W.B.P., and others.—A cheap and effective acoustic or thread telephone may be made by turning from wood a mouthpiece, A, and attaching to it a disk, B, of ferrotype plate. The mouthpiece should be 2¼ inches in its largest diameter, and should have an annular surface ¼ inch wide for receiving the disk, B, which is attached by means of sealing wax. The wax is first applied to the wood, and the disk is warmed and pressed against the mouthpiece. The disk is 2¼



inches in diameter. The portion left free to vibrate is 1¾ inch in diameter. The larger internal diameter of the mouthpiece is 1¾ inch, the smaller ½ inch. There is a small hole in the center of the diaphragm for receiving the thread, which also passes through a small piece of soft rubber and is knotted. The telephone thread must be supported on small elastic bands which must be put under tension. The string must also be taut. By means of this arrangement sound may be conducted at any desired angle, the elastic rubber supports being arranged as shown at the corners of the engraving. Whispers and even breathing may be distinctly heard over a long distance. When talking loud the receiving instrument should be removed 2 inches from the ear.

(29) H. W. A. writes: In your issue of July 6, Mr. Edison describes the arrangement of a "free lever resting on the receiving diaphragm, which answers very well for calling purposes at telephone stations where there is comparatively but little noise." Can anything of the kind be applied to the Bell telephone? A. Something similar has been applied to the Bell telephone.

(30) E. I. asks: 1. What metal is used as a positive electrode in coating copper with iron? A. Iron. 2. What composition is used in making a mould from steel plate engravings for electrotyping? A. Gutta percha, wax, fusible metal, or plaster of Paris. Gutta percha is probably the best.

COMMUNICATIONS RECEIVED.

The Editor of the SCIENTIFIC AMERICAN acknowledges with much pleasure the receipt of original papers and contributions on the following subjects:

Motors. By D. E. P.
Steam Yacht. By G. F. S.
Potato Disease, etc. By T. C.
An Invention Wanted. By W. G. S.
The Use of Mechanism. By J. B. and T. B. McC.
Quantitative Psychology. By J. M. M.
What is the Sun composed of? By T. B. McC.

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MINERALS, ETC.—Specimens have been received from the following correspondents, and examined, with the results stated:

E. W. D.—Consists principally of orthoclase, quartz, and hornblende.—E. A. H.—No. 1 is chert or flint. It is not a quartz pseudomorph after wood, as supposed. No. 20 is anhydrite. No. 3 a limestone somewhat resembling that used for lithographic purposes. No. 89 is calcite. No. 300. The fossil shell was too mutilated for classification. No. 11 is an impure limestone. No. 173 is orthoclase containing seams of muscovite. No. 214 is calcite colored with iron. No. 194. These fossils will be referred to hereafter. No. 83 is a specimen of an extinct genus of the family *Malleacea*, of which the genera *Avicula*, *Perna* and *meleagrina* are representatives.—W. P. E. and J. E. H.—It is the pollen of the common white pine (*Pinus strobus*).—S. S.—It is principally ferrous sulphate and alum.—A. M. K.—It is iron sulphide and arsenide—mispickel.—G.M.H.—It is nodular iron pyrites.—L. S. S.—No. 1 is hornblende and quartz. No. 2 is hornblende schist, containing ferropyrite with a trace of nickel and arsenic.—J. L. F.—It is chalcedony—a variety of quartz.—G. H. M.—It contains iron sulphide and copper sulphide—chalcopyrite. The ore may be of some value.

HINTS TO CORRESPONDENTS.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries fail to appear should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them. The address of the writer should always be given.

Inquiries relating to patents, or to the patentability of inventions, assignments, etc.. will not be published here. All such questions, when initials only are given, are thrown into the waste basket, as it would fill half of our paper to print them all; but we generally take pleasure in answering briefly by mail, if the writer's address is given.

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH

Letters Patent of the United States were Granted in the Week Ending

May 21, 1878,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

A complete copy of any patent in the annexed list, including both the specifications and drawings, will be furnished from this office for one dollar. In ordering, please state the number and date of the patent desired and remit to Munn & Co., 37 Park Row, New York city.

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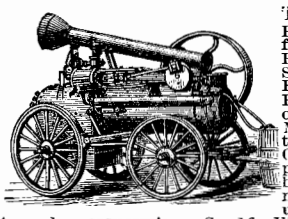

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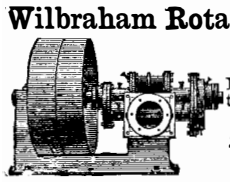

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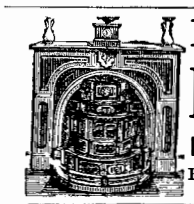

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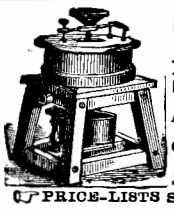

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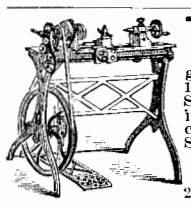

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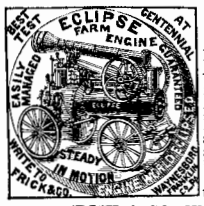

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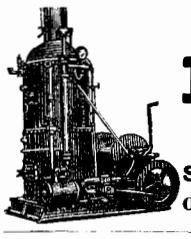

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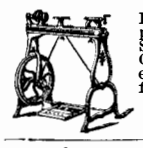

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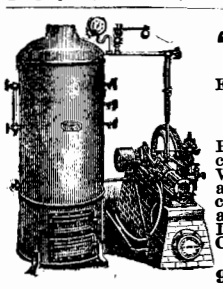

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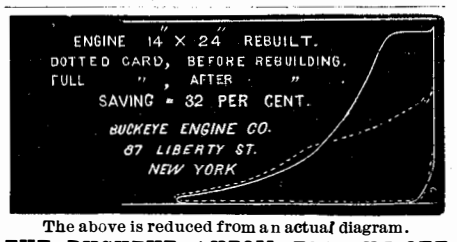

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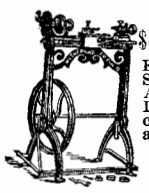

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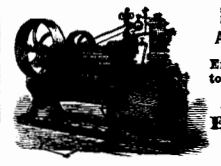

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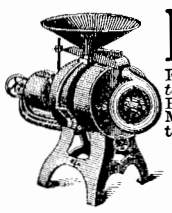

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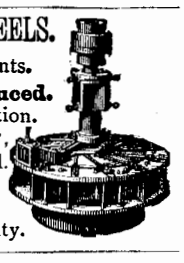

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